THE IRON TRADE REVIEW

VOLUME XXXVI CLEVELAND, OHIO, AUGUST 27, 1903 NUMBER 35

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron market is still dominated by the feeling that prices have not yet fully reflected the changing relation between supply and demand. The average buyer is proving his ability to wait and sellers, in many cases, are showing more anxiety for tonnage. Thus far the buying by the leading harvesting machinery interests has been the only conspicuous development in August. Its pig iron purchases for its gray iron and malleable foundries are in the neighborhood of 75,000 tons; and contracts for 15,000 tons of sheets and 6,000 tons of pipes and tubes have been added. It is now stated that the steel bar contract has not been closed, though it is expected from 40,000 to 50,000 tons will be needed above the output of the company's own mill. Recent purchases of malleable Bessemer iron have included a portion of the requirements of several large malleable foundries, the latter having taken contracts covering the wants of a number of agricultural machinery manufacturers at prices below last year's. Car works have done relatively little buying for next year's requirements, the outlook for car orders being far less promising than at this time last year. It is understood that the 20,000 tons of pig iron for which the International Harvester Co. came into the market last week has not been placed. Reports that bids as low as $11 were made on this cannot be verified, $11.50, Birmingham, for No. 2 foundry, being the lowest authenticated price reported. There has been a good deal of cutting below the association price and $11.75 is well established. Buying has been better in Central and Western territory since the $12 basis was officially decided on, but Pittsburg and Eastern markets report foundrymen still holding off. Southern pig iron producers, on the heels of the advanced wage for coal mining granted by the arbitration commission, are asking for a 50-cent reduction in pig iron freights. The sharp decline in iron is bearing hard on furnaces that buy all their raw materials in the market, and blowing out has already begun. More will follow. While some new and modern furnaces are starting up, adding to the make of foundry iron, the curtailment movement is greater and may soon become a factor of some moment. Northern furnaces have been holding for $16, at furnace, for No. 2 foundry, but in the past week $15.75 has been done and $15.50 has been quoted on large business. Bessemer iron is nominally $17 at Valley furnace, but there is no demand and no immediate expectation that fourth-quarter business will be placed by the Steel Corporation. A 50,000-ton rail order from the Baltimore & Ohio road was placed last week with Pennsylvania mills. The large producers of steel, while well supplied with contracts on some of their products are assiduously sounding the trade in other lines for indications of the volume of fall business. Pipe and tinplate works are well provided for, and the wire trade has held up better than was expected, with a good outlook for the fall. In bars, sheets, shapes and plates assurance for the rest of the year is thus far lacking. There has been fresh cutting in sheets, and the bar trade has shown new evidences of weakness. The Amalgamated Association will hold a conference next week to devise relief for workers in union sheet mills. Many of the latter have been shut down, and production is concentrated in non-union mills which have no limit on output. In the past week 1.55c Chicago has been the basis of sales of bar iron and at some Northern Ohio points which nearby mills can command at slight freight. 1.55c has been cut on large business, though on ordinary lots 1.60c Youngstown is still held. The low prices made on bar iron in contracts involving both iron and steel are putting considerable pressure on the steel bar agreement. Within two weeks the corn and cotton crops can be better gauged. If the outcome is sufficiently favorable the long-awaited buying movement in finished steel, as well as in foundry iron may be seen.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, Aug. 26.

The past week has been one of extreme quiet in the iron and steel trade, and the only transaction of importance was a contract for 50,000 tons of rails for next year's delivery by the Baltimore & Ohio Railroad. The Carnegie Steel Co. received 28,000 tons, Maryland Steel Co. 10,000 tons and the Cambria Steel Co. 12,000 tons. A few smaller rail orders were placed, bringing the total rail tonnage for the week close to 60,000 tons. In other finished lines there is little buying and the current trade is limited entirely to meet demands for immediate shipment and consumption. In steel bars the large interests continue to hold off, and the International Harvester Co. is said not to have placed its order, contrary reports notwithstanding. A large tonnage from this source is expected by the mills, but it has been expected at almost any time during the past four weeks. Outside implement interests are buying for immediate requirements only, and are not contracting for the future, believing that prices will not advance and if there should be any change conditions are more favorable to a reduction. Specifications on plates and structural material continue light and the buying of sheets is limited entirely to very small lots. On the other hand the pipe and tube trade continues to flourish. One department of the National Tube Co. was placed on double turn this week for the first time in two years in order to make early deliveries on a large order. The every-day demand also continues good and the tonnage closed thus far this month is above the normal.

The pig iron market continues to sag and Northern brands have sought still lower levels during the week. The quotations of most of the furnaces selling in this district range from $16.50 to $16.75 for No. 2. On forge iron $15.50 has been done and quotations of $15.25 have been made. Several Southern furnaces outside of the pig iron association are offering their product at 25 cents per ton below the association price. Furnaces offering Bessemer have been holding at $17, furnace, but there is little doubt that this could be shaded. The transactions of the week have been in 100 and 200-ton lots almost entirely and consumers are manifesting no interest whatever in covering for future requirements. Local consumers believe that still lower prices will prevail.

Pig Iron.—With very few exceptions, all of the large melters of foundry iron in this district are now carrying stocks in their yards to meet all requirements for from six weeks to two months. Present market conditions are such as would not warrant buying for future requirements, the foundrymen argue, and they are choosing to wait until the market settles. There has been very little buying during the week and the orders placed run from a carload to 200 tons. Still lower quotations have been made by

Northern furnaces, No. 2 having sold in one instance at $16.35, Pittsburg, while the general range of quotations is from $16.50 to $16.75. On forge iron $15.50, Pittsburg, has been done and one lot of forge has been offered at $15.25. Southern forge is offered in this market at $15.35, which is 25 cents below the Southern association price. The only transaction in Bessemer iron reported was for a few carloads, already loaded on cars at the furnace and which had to be disposed of. It brought $16.50 at the furnace. Heavy buyers of Bessemer iron are not even asking for quotations and the offerings of the majority of the Valley operators are at $17 at the furnace. The United States Steel Corporation pig iron committee will not meet again until next month and until this meeting is held it is certain that no iron will be bought. We revise quotations as follows:

Bessemer, Valley	17 00
Bessemer, Pittsburg	17 85
No. 1 Foundry	17 25 to 17 50
No. 2 Foundry	16 50 to 17 00
Gray Forge, Pittsburg	15 50 to 15 75
Chilled Basic, Valley	17 00 to 17 25
Chilled Basic, Pittsburg	17 85 to 18 10

Steel.—None of the transactions of the week with mills in the billet pool exceeded 1,000 tons, while most of the orders placed called for from one to two carloads of steel. During September it is probable that the plant of the Clairton Steel Co., Clairton, Pa., will be shut down for repairs, but the exact date for shutting down has not been definitely decided. We make the following quotations: Bessemer billets 4x4 inches and slabs up to and including .20 carbon, $27, Pittsburg, Wheeling or Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O.; .21 to .60 carbon, $1 advance, and .61 to 1.00 carbon, $2 advance; open-hearth billets up to and including .60 carbon, $28, and over .60 carbon, $29; billets smaller than 3⅞-inch and sheet and tin bars are $1 per ton extra; Bessemer rods, $35.50 to $36 and open-hearth are held at $1 advance.

Ferro-Manganese.—The market continues quiet and offerings of small lots are reported at $48.

Spelter.—The market has advanced slightly during the week and prime Western grades are held at 5.80c to 5.83½c, Pittsburg.

Skelp.—The market continues quiet and grooved iron skelp is held nominally at 1.75c to 1.80c. Sheared iron skelp is held at 1.80c to 1.85c. Steel skelp is quoted at 1.70c to 1.75c.

Muck Bar.—There is little doing and quotations are nominally $29 to $30 per ton.

Rails and Track Material.—Rail orders placed the past week aggregate about 60,000 tons. The Baltimore & Ohio railroad placed its order for 1904 delivery amounting to 50,000 tons. The light rail market is quiet. We make the following quotations: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 8 pounds, in carload lots, $39; less than carload lots, $40; 12 pounds, $33.50; 16 and 20 pounds, $32.25 to $33; 25 to 40 pounds, $32 to $32.50. Track material: Spikes, 2.05c to 2.10c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 2c to 2.10c is asked.

Plates.—Specifications on plates continue very light and the output of some of the larger mills in this district has been curtailed in consequence. We make the following quotations: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plate 3-16-inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds, for less than carload lots. Terms, net cash, in 30 days.

Bars.—There are contrary reports concerning the order for steel bars from the International Harvester Co. for the ensuing year. It is understood that the company bought some bars a few weeks ago, but it is said that 40,000 to 50,000 tons are still pending. Current business is fair but there is practically no buying for future delivery. Quotations on hoops and bands have been reaffirmed and will no doubt be firmly maintained. There are reports of fresh cutting on bar iron wherever a round lot is involved. We quote: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.70c; over 3 inches, 1.80c; common bar iron, 1.60c to 1.65c, Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

Structural Material.—Specifications on running contracts continue light and there is little new business being closed by the local mills. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Pipes and Tubes.—The pipe and tube trade continues in excellent condition and current demand the past week has been above the normal for this season of the year. We quote as follows in carload lots to consumers, f. o. b. Pittsburg, plus freight according to Tube Rate Book to destination:

MERCHANT PIPE.

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Wrought Iron Pipe. Black. Percent.	Wrought Iron Pipe. Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	62	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	65	53	61	50
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	66	54	62	51
Extra Strong Plain End				
⅛ to 8 inch	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End				
½ to 8 inch	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

tons.

Sheets.—Outside of the order placed by the International Harvester Co. last week for sheets there has been little doing in that trade. Jobbers have not yet come into the market to cover fall requirements, but will have to do so soon as their stocks are known to be very low. Black sheets in 500-bundle lots and over are held as follows: No. 28, 2.70c to 2.75c; No. 27, 2.60c to 2.65c; No. 26, 2.50c to 2.55c; Nos. 22 and 24, 2.40c to 2.45c; Nos. 18 and 20, 2.30c to 2.35c; Nos. 14 and 16, 2.20c to 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.55c to 2.60c; No. 18, 2.80c to 2.85c; No. 26, 3.30c to 3.35c; No. 27, 3.55c to 3.60c; No. 28, 3.80c to 3.85c; No. 29, 4.30c to 4.35c; No. 30, 4.45c to 4.50c.

Merchant Steel.—Specifications on contracts for high grade steel continue very light, although the prospects

for a good fall demand are extremely bright. We quote: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots. Tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. Tool steel is quoted 7 cents and upwards, according to the grade.

Old Material.—The last deliveries on two contracts for 50,000 tons of old material closed by the United States Steel Corporation last January will be made within the next few weeks. Thus far the constituent companies of the corporation have not signified any intention of buying for future delivery, but it is certain that there will be some buying to cover requirements for immediate consumption. Dealers are experiencing some trouble in having mills take in high priced material owing to the extremely low prices that are now prevailing on all lines of material.

Coke.—Considerable furnace coke continues to be offered by producers for immediate shipment owing to the number of stacks that are out in the Valleys. Sales continue to be made at $2 to $2.25 for strictly Connellsville furnace coke and foundry is held at $2.75 to $3. Outside furnace coke is quoted at $1.50 to $1.75 and foundry at $2 to $2.50. The production of both the upper and lower regions during the week ending Saturday, Aug. 15, showed a slight falling off as compared with that of the previous week. The production of the upper region amounted to 245,680 tons and that of the lower region 51,795 tons.

Wire and Wire Nails.—Jobbers' stocks are very light and all the mills expect a heavy fall trade in all lines. Thus far the buying has been somewhat limited. We quote: Wire nails, carload lots, to jobbers, f. o. b. cars, Pittsburg, $2; plain wire, carload lots, $1.90; barb wire, carload lots, $2.30; staples, carload lots, $2.20. Galvanizing 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $2.15, and less than carload lots, $2.20, f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2.25 in carload lots and $2.30 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

CHICAGO.

OFFICE OF *The Iron Trade Review*, 1115 MONADNOCK BLOCK, Aug. 25.

Now that the Southern Furnace Association has again reduced its prices, the question most frequently asked between buyers and sellers in this section is, whether pig iron has reached rock bottom. Consumers find it hard to believe that the market will not go lower, and the uncertainty regarding this question is withholding many orders which otherwise would be placed. Buying in this city has not been stimulated to any great extent by the cut of $1.50 made last week, though there has been a comparatively good demand. In finished material the market is without marked improvement. Trade in sheets is particularly bad, and cutting of prices is reported. Bar iron is weak, now selling at 1.55c, Chicago. For steel bars there is a good demand. Plates are without change, a fair tonnage having been closed in the past week. There is little inquiry for either billets or structural steel, and no change in prices. Tubular goods, merchant steel, light and heavy rails and track supplies are active, mills being behind on deliveries of light rails. Prices of old material have fallen off about $1.00 a ton owing to the weakness of pig iron and bars, with a consequent reduction in demand.

It is stated authoritatively that the International Harvester Co. has not yet placed its full order for steel bars. No tonnage has yet been determined upon, though reports put the requirements yet to be covered at 40,000 to 50,000 tons of steel, 1,500 tons of bar iron and 600 tons of nut and bolt iron. The company purchased 6,000 tons of tubes, pipes and nipples in the past week, for deliveries extending to August, 1904; and a few weeks previous placed contracts for 15,000 tons of sheets, both black and galvanized. During the past week bids were asked on an additional lot of 20,000 tons of foundry irons.

Pig Iron.—Transactions during the week have involved a number of large orders and a corresponding increase in the volume of small business. Buying, however, has not yet reached the proportions satisfactory to the producers, though the outlook is more encouraging. The trade appears to have lost faith in the permanency of "official" quotations, since buyers have been able to secure a lower rate several times in the past by pursuing a waiting policy. That further official cuts will be made is the confident expectation of consumers, if this course is continued, and reports of iron offered at $11.50 to $11.75, Birmingham, for No. 2 foundry are already current. There cannot be much competition expected from the independent furnaces in the future, inasmuch as a majority of these are sold up for the next 60 days, while those that are not cannot profitably sell pig iron at some of the prices reported under the present high costs of fuel and labor. Four Southern furnaces have gone out of blast within the past ten days, and it is reported that others are contemplating like action. The elimination of the product of these stacks is welcomed by the large producers, as it will not only help in maintaining prices, but will improve the buying. Another factor that will have a strong influence on prices is the car shortage which is likely to develop in the near future. This has been felt in a moderate degree for some weeks past, and it is doubtful if the country will escape this year, when the movement of cotton and grain is in full swing, a repetition of the traffic blockades which have prevailed during the fall and winter of the last three years. Orders have been closed for foundry grades during the week in lots as high as 1,500 tons, though the bulk of the tonnage has been made up of carload orders and lots of 200 to 500 tons. There has been some demand for basic iron, an order for 2,000 tons having been placed at $12.25, Birmingham. High silicon iron has also been in good demand, several small orders having been placed at prices quoted below. Malleable foundries have also been buying freely, contracts including one for 2,000 tons of malleable Bessemer and another for 12,000 tons. The International Harvester Co. has also asked bids on 20,000 tons of foundry iron, and it is reported that prices have been submitted below the official basis. Quotations are as follows:

Lake Superior charcoal	$20 50 to 21 50
Local Coke Foundry No. 1	18 00 to 18 25
Local Coke Foundry No. 2	17 50 to 17 75
Local Coke Foundry No. 3	17 00 to 17 25
Local Scotch Foundry No. 1	18 00 to 18 25
Southern Coke No. 1	16 60 to 16 85
Southern Coke No. 2	16 10 to 16 35
Southern Coke No. 3	15 65 to 15 85
Southern Coke No. 4	15 10 to 15 35
Southern No. 1 soft	16 60 to 16 85
Southern No. 2 soft	16 10 to 16 35
Southern Gray Forge	14 85 to 15 10
Southern Silveries (4% to 5% silicon)	18 35 to 18 55
Southern Silveries (5% to 6% silicon)	18 85 to 19 25
Jackson Co. Silveries (6% to 8% silicon)	20 30 to 21 50
Jackson Co. Silveries (8% to 10% silicon)	21 30 to 22 30
Ohio Strong Softeners	21 00 to 22 00
Alabama and Georgia Car Wheel	25 25 to 26 25
Malleable Bessemer	17 50 to 18 00
Basic iron	16 25 to 17 25

Billets.—Little interest has been displayed in billets in the past week and sales have been few in number. There is no change in the regular quotations of $28 for Bessemer, $29 for open-hearth, and $32 for forging, carload lots.

Bars.—New inquiry for steel bars approximates 20,000 tons, a large portion of which it is expected will be placed this week. The International Harvester Co.'s full order has not yet been placed, as the tonnage required has not been determined upon. Reports place the amount at 40,000 to 50,000 tons, but this cannot be confirmed. There is a fair demand for bar iron, but few manufacturers are getting a sufficient tonnage to keep all their mills busy, one producer reporting that its sales this month are 20 percent less than its output. There is keen competition for the business offered and quotations are now down to the basis of 1.55c, Chicago. We quote mill shipments, Chicago delivery: Bessemer steel, 1.76½c; angles, less than 3x3, 1.86½c base; hoops in lots of 250 tons and greater, 2.06½; less than this amount, 2.16½c; iron, 1.55c to 1.60c. Quotations from store, less than carload lots, steel, 2c; iron, 2c to 2.10c; hoops, 2.30c to 2.40c; angles, 2.10c rates.

Sheets.—Demand for sheets is confined almost exclusively to the heavy gauges, and this is not of large proportions. Light sheets show little movement, and it is re-

ported prices are being cut. The official quotations on No. 27 black are unchanged at 2.86½c to 2.91½c, carload lots, f. o. b. Chicago; No. 28, black, 2.96½c to 3.01½c. Other producers, however, are offering these sizes at the following prices: No. 27, black, 2.75c to 2.85c; No. 28, 2.85c to 2.95c. Galvanized sheets from mill, carload lots, Chicago delivery, are quoted 75 and 10 to 75 and 10 and 2½ percent. On lots from store, we quote No. 27 black, 2.90c to 3.05c; No. 28, 3.05c to 3.15c. Galvanized, 75 to 75 and 5 percent.

Plates.—There has been fair buying and specifications have also been coming in freely. We quote mill prices, Chicago delivery: Tank steel, ¼-inch and heavier, 1.75c; flange steel, 1.85c. Prices for lots from stock, tank steel, ¼-inch and heavier, 2c to 2.10c; 3-16, 2.10c to 2.15c; No. 8, 2.15c to 2.20c; No. 10, 2.30c to 2.35c; flange steel, 2.40c to 2.50c.

Structural Material.—Demand is of light proportions, though projects for the erection of several new buildings are coming to the front. Store trade is fairly brisk, but quotations have been reduced. We quote mill shipments, Chicago delivery, as follows: Beams and channels, 16 inches and under, 1.75c; 18 inches and over, 1.85c; universal plates, 1.75c; angles, 3x3 and larger, 1.75c; tees, 3x3 and larger, 1.80c; zees, 1.75c. Lots from store, 2.10c to 2.25c per 100 pounds, rates.

Merchant Steel.—Some new business has been placed during the week, and a fair tonnage has come into the market for bids. Specifications are also good. Prices are without material change. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c, flat sizes; concave and convex, 2.25c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.35c to 2.45c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; special, 13c and upwards; less than carload lots, 5 and 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than carload lots, 42 percent off.

Merchant Pipe.—Producers report a good demand for all sizes, with a correspondingly good tonnage in specifications. The International Harvester Co. placed an order last week for 6,000 tons of pipe, tubes and nipples, for deliveries extending until August, 1904. We quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ¾ in. inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	71.85	61.85
7 to 12 inches inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ per cent advance over above prices.

Boiler Tubes.—New business and specifications continue in good volume, and mills are hard pressed to keep up with deliveries. Prices are firm and without change. Quotations below are on carload lots, mill shipments, f. o. b. Chicago. On less than carload lots, 12½ percent is to be added:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	48.35	38.35
1¾ to 2½ in.	55.85	35.85
2¾ to 5 in.	60.85	45.85
6 to 13 in.	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	40	35
1¾ to 2½ in.	50	32½
2¾ to 5 in.	57½	42½
6 to 13 in.	50	32½

Cast Iron Pipe.—Buying has been active in the week under review, but mainly in small lots. A better inquiry has manifested itself in the last few weeks as a result of the readjustment of prices. Carload lots are quoted f. o. b. Chicago, 4-inch water pipe, $31; 6-inch, $30; 8-inch and upwards, $29; gas pipe, $1 a ton higher.

Rails and Track Supplies.—Contracts for several thousand tons of standard sections have been placed, and a good buying has been in evidence for light rails and track supplies: On light rails, mills are about six weeks behind in deliveries, and one of the leading local producers is contemplating withdrawing from the market for the time being. We quote standard sections 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality, rails, $27; 25-pound rails, $32 to $34; 12-pound rails, $39 to $40, with regular differentials for intermediate sizes. Track supplies, mill shipments: Angle bars, 2c to 2.10c; spikes, first quality, 2.20c (out of store, carload lots, 2.25c to 2.35c rates); second quality, 2.10c; track bolts, 3½x¾ with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3c to 3.10c, with usual differentials for other sizes.

Wire and Wire Nails.—The demand for wire products continues to improve, and it is expected from now on into the fall a heavy buying movement will be seen. The business of the summer has been larger than was to be expected from a dull season. Quotations to jobbers, Chicago delivery, are as follows: Wire nails, carload lots, $2.20; less than carload lots, $2.30. Cut nails, steel, carload lots, $2.26½; less than carload lots, $2.36½. Plain wire, $2.10 carloads, and $2.20 in small lots; galvanized, carloads, $2.40; smaller lots, $2.50c. Barbed wire, carloads, $2.50; less than carloads, $2.60; galvanized, carloads, $2.80; less than carloads, $2.90; staples, carloads, $2.30; smaller lots, $2.40; galvanized, carloads, $2.60; small lots, $2.70. Bale ties, 82½ and 5 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Coke.—An incipient car shortage at various points in the East has slightly affected local prices and deliveries. One of the anomalies of the coke situation in this city is that fuel on track brings a lower price than that for future deliveries. This state of affairs has somewhat confused the situation though the anxiety to escape the heavy car demurrage on the part of dealers is reducing the fuel on track to a minimum. Guaranteed Connellsville, 72-hour coke, under 1.00 sulphur and running 8 percent to 12 percent ash, f. o. b. Chicago, is quoted at $5.65 to $6.15; Virginia and West Virginia grades are as follows: New River, $4.65c to $5; Pocahontas, $4.65 to $5; Stonega, $4.85 to $5.25.

Old Material.—As a result of the weakness developed in finished products, the prices of scrap have fallen from $1 to $1.50 a ton. There are no buyers in the market either among the mills or dealers. Railroads are the only offerers, and these are taking the best prices they can obtain. We have revised our quotations, and quote dealers' selling prices for gross tons as follows:

Old iron rails	$17 50 to 18 00
Old steel rails (mixed lengths)	14 50 to 15 00
Old steel rails (long lengths)	16 00 to 16 50
Relaying rails	28 50 to 30 00
Old wheels	17 50 to 18 00
Heavy melting steel	14 00 to 14 50
Mixed country steel	12 00 to 12 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$13 50 to 14 00
No. 2 R. R. wrought	12 00 to 12 50
Shafting	14 50 to 15 00
Dealers' forge, No. 1	12 00 to 12 50
No. 1 busheling and wrought pipe	11 00 to 11 25
No. 1 cast	14 00 to 14 50
Heavy cast (300 pounds and over)	10 00 to 10 50
Agricultural malleable	13 50 to 14 00
Iron axles	19 00 to 19 50
Steel axles	17 00 to 17 50
Cast borings	5 50 to 6 00
Mixed borings, etc	5 50 to 6 00
Wrought turnings	10 50 to 11 00
Machine shop turnings	10 50 to 11 00
Iron axle turnings	10 75 to 11 25
Steel axle turnings	10 75 to 11 25
Stove plate and light cast scrap	10 00 to 10 50
Old iron splice bars	14 25 to 15 00

Rogers Brown & Co., Chicago, have been appointed exclusive selling agents for the Tuscaloosa brand of foundry iron made by the Central Iron & Coal Co., Tuscaloosa, Ala.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Aug. 25.

Somewhat better demand for foundry iron, increased competition in sheets, lower prices for bar iron, and in-

tense interest in expected developments in finished materials, were features of the market this week.

Iron Ore.—Shipments for the month drawing to a close will be less than for August of last year. Expectations of ore dealers that purchases of considerable size would be made about this time have not been realized and, with a declining market for pig iron, and the probability that some furnaces will not run throughout the winter, it is not believed that much interest will be shown in the ore market. Freight charges are stationary. Good dispatch is being given.

Pig Iron.—There has been more buying of foundry iron in lots of moderate size, but no developments of special interest have followed the recent reduction in the price of Southern association furnaces. Ohio furnaces are said to be selling at $16 and a shade under for No. 2 foundry at the furnace, some stacks which have recently come in being a factor in the competition. A fair tonnage of Southern iron is being sold in this territory on the association basis of $12 for No. 2. We quote Cleveland delivery, save in the case of gray forge, on which the quotation is at Valley furnace:

Bessemer	$17 60 to 17 85
No. 1 Strong Foundry	17 25 to 17 75
No. 2 Strong Foundry	16 50 to 17 00
No. 3 Foundry	16 00 to 16 25
Scotch No. 1	17 25 to 17 75
Scotch No. 2	16 75 to 17 00
Gray Forge, Valley furnace	15 00 to 15 25
Lake Superior charcoal	21 00 to 22 00

Finished Material.—An unusually large business is being done in tin plate and it is difficult to obtain delivery in less than several months. Jobbers have not found it easy to keep their stocks replenished. The sheet business, which had been in good condition for some time, has recently become somewhat demoralized. The independent sellers are cutting prices and many mills are running irregularly. On sales made through jobbers, the prices for the principal products are unchanged as follows: Galvanized sheets, mill sales, carload lots, Nos. 10 and 11, 2.60c; Nos. 12 to 14, 2.70c; Nos. 18 to 21, 3c; Nos. 22 to 24, 3.20c; Nos. 25 and 26, 3.55c; No. 27, 3.80c; No. 28, 4.05c; No. 29, 4.45c; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75 and 5 off. For 3-16-inch black sheets and heavier we quote 2.15c, Cleveland. Mill sales of black sheets to consumers are made on the following basis: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c. The following are prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.60c to 2.70c; Nos. 18-20, 2.75c to 2.85c; Nos. 22-24, 2.85c to 2.95c; Nos. 25-26, 2.95c to 3.05c; No. 27, 3.05c to 3.15c; No. 28, 3.15c to 3.25c.

Usually at this time of the year, there is a marked diminution in the demand for structural material, but business is now holding up well for the end of the summer. A new feature in building operations in Cleveland is the increasing use of iron and steel in the erection of private residences. Plates are dull. In bar iron there is keen competition for desirable business. The usual quotation for ordinary business is 1.60c, Valley mill, but where local Central Western mills become a factor in territory contiguous to them much lower prices are quoted, sales having been made at less than 1.55c, Toledo and Cleveland. On steel, the old prices, 1.60c Pittsburg for Bessemer and 1.70c for open-hearth, are still maintained, but there is stronger pressure for lower prices, in harmony with reductions on iron. On billets, interests not included in the agreement have offered concessions without making sales.

Old Material.—Some mills are making purchases, but there is very little activity and prices are still tending downward. We quote, all gross tons, f. o. b. Cleveland:

Old iron rails	$19 00 to 20 00
Old steel rails (over 6 feet)	17 00 to 18 00
Old steel rails (6 feet and under)	17 00 to 18 00
Old car wheels	17 00 to 18 00
No. 1 R. R. wrought	16 50 to 17 50
Mill scrap	14 00 to 14 50
No. 1 machine cast scrap	14 00 to 14 50
Iron axles	22 00 to 23 00
Steel axles	22 00 to 23 00
Axle turnings	14 00 to 15 00
Wrought turnings (free from cast)	12 00 to 13 00
Cast borings	6 50 to 7 00
Uncut wrought iron boilers	9 00 to 10 00
Steel boiler plates	14 00 to 15 00
Grate bars	10 00 to 12 00
Pipes and flues (clean)	13 00 to 14 00
Tank iron	13 00 to 14 00
Hoop and band iron	10 00 to 12 00
Sheet iron	8 00 to 9 00
Wrought drillings	12 00 to 13 00
Malleable iron (railroad)	17 00 to 18 00
Malleable iron (agricultural)	14 00 to 15 00
Stove plate	10 50 to 11 00
Heavy steel	15 00 to 16 00

CINCINNATI.

Aug. 25.

The coke market is somewhat irregular but is fairly steady. Sales are mainly on the basis of $2.75 to $3 at ovens. There is a fair tonnage being booked at these prices.

Pig Iron.—There has been more iron sold since the action of the associated furnaces on last Monday than for some time. Sales are mainly for 60 to 90 days' shipment where any fair sized quantity is ordered, with an occasional order covering deliveries through the balance of the year. Quite a number of single car lot orders are being taken which would indicate that some consumers are not yet ready to place their contracts for future requirements. On most of this small quick shipment business $12 Birmingham is obtained, but on any fair sized orders the price is $11.75, Birmingham. The associated furnaces have authorized their agents to shade the $12 schedule 25 cents per ton on desirable orders, so that this latter quotation is practically part of the association schedule. As the market appears today there is no Southern iron to be had below $11.75, Birmingham. The independent furnaces are keeping pace with the association furnaces in an effort to sustain the market at this level. In the trade there are rumors of sales at $11.50, but they can not be traced and as $11.75 is taking the business there is no good ground for the belief that a less price can be had. Northern irons are relatively easier than Southern. In the Ironton district $14.50 has been done for No. 2 foundry, but $14.75 to $15 is the current market. Trade sentiment is mixed as to the future of the market but it is a significant fact that sales agents are not advising their customers to come in now, but for the present the inside price is well maintained. The following are the prices current, f. o. b. Cincinnati:

Southern Foundry No. 1	$15 50 to 16 00
Southern Foundry No. 2	15 00 to 15 50
Southern Foundry No. 3	14 50 to 14 75
Southern Foundry No. 4	14 25 to 14 50
Southern Foundry No. 1 soft	15 50 to 16 00
Southern Foundry No. 2 soft	15 00 to 15 50
Gray forge	13 50 to 14 00
Northern Foundry No. 1	16 15 to 16 65
Northern Foundry No. 2	15 65 to 16 15
Southern car wheel iron	26 25 to 27 25

The producers of Southern pig iron are making an effort to secure a reduction of 50 cents in the freight rates from the Southern furnaces to Ohio River points. A petition has been presented to the railroads accompanied with full particulars as to why the concession should be made and maintaining that such action is necessary to enable them to compete with the Northern furnaces.

Finished Material.—The demand has fallen off this week and the trade is quiet. There is an easy tone all along the line and slight concessions can be obtained on even moderate orders. Jobbers are complaining that mills are competing with them for small orders in the structural lines and on any large business in the market there is enough competition to make prices look irregular. The bar iron market is weaker and while retail prices are not quotably lower they are not strictly maintained. In car lots bar iron is now openly quoted at 1.70c base and on large orders 1.65c can readily be done. Steel bars remain at 1.73c base, half extras, with the retail price 2c base, half extras, for iron and steel out of store. Galvanized sheets are being quoted at 75 and 5 percent off. We quote black sheets No. 27 at 2.78c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.10c; No. 27, 3.20c; No. 16, 2.65c; No. 14, 2.55c; No. 12, 2.45c; No. 10, 2.35c. Tank plates are firm and sell out of store at 2.15c for ¼-inch and 2.25c for 3-16-inch. Beams and channels are quoted at 2.15c to 2.25c from stock, and angles at 2.15c and 2.25c for base sizes. The merchant pipe market is steady but quiet as dealers are not buying for future wants.

Independent mills are not underselling the leading interest to an extent that disturbs prices and quotations are fairly well maintained.

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	63.7	53.7
½ inch	68.7	58.7	65.7	55.7
¾ to 6 inch, inclusive	73.7	63.7	70.7	60.7
7 to 12 inch, inclusive	67.7	57.7	64.7	54.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	35.2
1¾ to 2½ inch	54.2	34.2
2¾ to 5 inch	59.7	44.2
6 to 13 inch	54.2	34.2

Old Material.—There is no change in prices and the market is dull. Dealers are disposed to wait for more settled conditions and look for the fall to bring about a more active market. We quote:

Old No. 1 railroad wrought, net tons	$14 00 to 15 00
Cast machine and foundry, net tons	12 00 to 12 50
Old iron rails, gross tons	19 00 to 20 00
Old steel rails, gross tons	17 00 to 18 00
Old short lengths, gross tons	14 50 to 15 50
Old iron axles, net tons	20 00 to 21 00
Stove plate, net tons	9 00 to 9 50
Wrought turnings, net tons	11 00 to 11 50
Cast borings, net tons	6 00 to 6 50

PHILADELPHIA.

Aug. 25.

The markets are still unsettled and there is lack of confidence, especially as to finished materials. Consumers take what they must have for immediate use, and there are almost no sales for extended deliveries. Sellers accept business at gradually receding prices and buyers are very cautious.

Pig Iron.—Sales have been more numerous, but not of a character to strengthen the movement. The action of Southern association furnaces in again reducing the price has had little effect, as iron was already selling on a basis of $12 for No. 2 foundry. Sellers are anxious for business and there is plenty of iron to be had at $16.50 for No. 2 X foundry. Small lots still command $17. We quote: No. 1 X foundry $18 to $18.50; No. 2 X foundry, $16.50 to $17; No. 2 plain, $15.50 to $16.25; No. 3 foundry, $15 to $15.50; gray forge, $15.50 to $16; basic, $16 to $16.25.

Steel.—Business is somewhat more active, but the volume is not large. Buyers confine themselves to small lots. Foreign is offered at slightly lower prices than domestic, but the difference is not enough to take much business. Prices are $28.25 for Bessemer and $28.50 to $29 for basic, with foreign offered at $27.50.

Finished Material.—Conditions are not favorable. Orders are in fair numbers, but tonnage is light. Work at most of the mills depends largely upon day to day orders. Strikes have caused a great deal of trouble and after effects are still felt. We quote as follows: Plates in small lots, 1.80c to 1.85c; carload lots, ¼-inch and thicker, 1.75c to 1.80c; flange, 2c; marine, 2.10c to 2.15c; firebox, 2.20c to 2.25c. Bars in carloads are usually quoted at 1.60c to 1.65c for refined iron and 1.70c to 1.75c for steel bars. Structural material—Beams, angles and channels, ordinary sizes, 1.73½c to 1.80c for carload lots, with the usual addition for smaller quantities.

Old Material.—Steel scrap is in large supply and can be had at very low prices, being offered in some cases as low as $16.50. Business is dull. We quote: Old steel rails, $17 to $17.50; miscellaneous heavy steel scrap, $16.50 to $17; low phosphorus scrap, $24.50 to $25.50; old steel axles, $21 to $22; old iron axles, nominal, $22 to $23; old iron rails, nominal, $19 to $20; old car wheels, nominal, $19.50 to $20; choice scrap R. R. No. 1 wrought, $17.50 to $18; country scrap, $15 to $16; machinery cast, $15.50 to $16.50; No. 2 light scrap, forge, $16 to $17; No. 2 light scrap, ordinary, $11.50 to $12.50; wrought turnings, $12.50 to $13; wrought turnings, choice heavy, $13.50 to $14; cast borings, $8.25 to $8.75; stove plate, $11.50 to $12.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 25.

Pig Iron.—The developments of the week in the pig iron market have been disappointing to sellers. In our last report we were able to note inquiries for a good tonnage which were in a good way of being closed; but it now appears that those who made them have decided not to do anything for the time being. The larger consumers especially are disposed to let the market find its level, and while they do not as a whole say prices will go lower, they are confident that they will not go higher. They are convinced that a waiting policy will be the best to pursue. In the meantime they will only purchase as their immediate wants necessitate. Northern irons are a little easier, and there are some furnaces which announce that they would rather put their output in stock than dispose of it at some of the offers made them. In Southern irons, there are reports that the independent furnaces are selling below the associated schedule. Current trading is more active than it has been, and small lots aggregating a good tonnage have been placed. Rarely is a sale for extended delivery made, while the majority of orders given are followed with an urgent request for quick shipment. Advices from all quarters speak of foundrymen's stocks being at a very low ebb. It is said that many foundrymen have noticed a decided falling off in their business lately, and the season is not blamed for it either. As an offset, to this, it can be stated that the demand for coke at present is better than it has been in months. Prices rule at from $3 to $3.25 at the ovens, with large consumers getting the benefit of the former figure. New York prices on pig iron are as follows: Northern No. 1 X foundry, $17.25 to $17.50; No. 2 X, $16.50 to $17; No. 2 plain, $16.25 to $16.50; Southern No. 1 foundry, $16.25 to $16.75; No. 2 foundry, $15.75 to $16.25; No. 3 foundry, $15.25 to $15.75; No. 4 foundry, $14.75 to $15.25.

Rails.—Leading interests note more of a desire on the part of railroads to provide for their requirements for 1904. September is expected to give conclusive evidence of the fact. Present business is considered good. We quote $28 for standard sections at mill.

Finished Iron and Steel.—Nothing of especial interest has come to the surface during the past week. There are no large orders, but those for small quantities make up a fair tonnage. Structural mills are keenly competing for business, and prices show a reactionary tendency. Sheets are dull in this vicinity, and reports of cut prices continue. Bars are weak, with no large business being placed. Plates are inclined to weakness, and for such little business as is offering, there is the greatest rivalry. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 1.80c to 1.90c; flange, 1.90c to 2.10c; firebox, 2.10c to 2.20c; refined iron bars, 1.75c to 1.80c; soft steel bars, 1.70c to 1.75c; steel sheets, in car loads, New York, No. 28, black, 2.90c to 3.05c; galvanized 75 and 2½ off.

BIRMINGHAM, ALA.

August 25.

A number of large orders are reported to have been booked within the past week, under the ruling prices now fixed by the associated furnaces, most of the deliveries being prompt or extended only over short periods. There seems to be no considerable buying for extended deliveries, and in fact the makers claim they do not care to sell in advance at present prices, particularly in the face of the fact that the cost of production is now greater than it has been in many years, with still higher cost in view, considering the advance in miners' wages granted by the board of arbitration last week. One feature of the testimony before this board was that of a large producer in the district to the effect that its present cost of producing a ton of pig iron approximated $11. If such figure be taken as a guide, others less favorably situated as to source of supply for raw materials would not be able to produce iron for much

below $12, and with a declining market must soon suspend operations.

There are still rumors in all directions as to still lower prices—one report being to the effect that No. 2 foundry had been offered in large quantity to one buyer at $11. Persistent inquiry fails to confirm this report, or to locate any prices by any concern in the district at less than $11.50. The independent furnaces show a disposition to maintain the $12 basis, claiming they have booked all the low-priced iron they desire. There are several furnaces out of blast, and one more to go out this week. The Republic company will put out one of its three stacks, having just blown in its No. 2 stack, recently overhauled and enlarged. The new furnace of the Alabama Consolidated Coal & Iron Co., which takes the place of its old stack at that point, was successfully fired Saturday night and is reported working well. Reference has heretofore been made as to the size and expected capacity of this stack. It seems the production of this district for September will show practically the same as July, considering both the stacks out of commission and new ones going in.

The foundries of the district report business all that could be expected. Crops are reported in excellent condition, railroad traffic continues good, and prospects for a splendid trade this fall and winter seem excellent. This, of course, means continued prosperity for all lines of manufactures throughout this district.

The miners are working in full force again and there seems ample supply of coal, though it is expected the prices will advance when the trade for domestic coal opens up well. Coke is lower, ruling at $3.25 to $3.75, Birmingham, for furnace or 48-hour coke, with 25c to 50c more for foundry coke.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 25.

Pig Tin.—While quotations are practically the same as when we last quoted them, the undertone is weaker. Heavy arrivals recently have more than relieved the scarity of spot we had occasion to note a few weeks ago, and buyers show no willingness to buy under the normal conditions which now exist. In London the market sold off during the week for £1 in spot, while futures declined also, but not so decisively. Today's closings at the Metal Exchange were as follows: Spot and August, 27.75c to 27.90c; September, 27.60c to 27.90c; October, 27.40c to 27.70c. London closed today as follows: Spot, £127; futures, £124 10s. Arrivals at Atlantic ports for the month to date amount to 2,920 tons, with 1,875 tons afloat.

Copper.—Prices advanced about ¼c for all grades during the past week. There are indications that the heavy buying movement which set in about ten days ago, is over. This is especially true so far as the domestic demand is concerned, but the buying for export has shown a notable improvement recently. Prices in the open market continue to keep on a parity with those on "change." The London market, during the week while active, is now slightly lower than this time a week ago. The closing prices today at the Metal Exchange were as follows: Lake, 13¾c to 13⅞c; electrolytic, 13⅝c to 13¾c; casting, 13⅜c to 13½c. London's closings today follow: Spot, £59 7s 6d; futures, £58 10s. Exports for the month to date aggregate 6,566 tons, against 7,333 tons for a similar period last year.

Lead.—Is firm and unchanged at 4.25c for spot. St. Louis is slightly higher at 4⅛c. London is lower at £11 3s 9d.

Spelter.—Is quiet at 6.00c for spot. St. Louis is stronger at 5.75c for spot. London advanced to £21.

Antimony.—Cookson's is 7¼c, Hallett's 6⅜c, and outside brands 6c to 6¼c.

Quicksilver.—Still quoted at $47.50 per flask of 76½ pounds in lots of 100 flasks. London unchanged at £8 2s 6d.

Nickel.—Is selling at 40c to 47c for large lots down to a ton, and 50c and 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, Aug. 25.

Copper is dull and buying light, consumers continuing the practice of placing orders for small lots to tide over their immediate wants. Manufacturers have made four advances in prices within the past week in the hope of compelling the trade to cover for their season's requirements, but so far without any success in this direction. Another advance in copper is contemplated within a few days. With the exception of spelter and pig lead, all other metals are quiet. Both these products are scarce and prices firm, lead having advanced during the week under review. We have revised some of our prices and quote as follows: Lake copper, carloads, 13½c to 13⅝c; casting, 13¼c to 13⅜c. Pig tin, which has dropped one point, 29c. Pig lead, 4.20c in 50 to 100-ton lots, and 4¾c to 5c in small quantities; spelter, 5½c in carload lots, and 6c to 6¼c in lesser quantities; sheet zinc, 6¼c; antimony, 10¾c to 11c for Cookson's, and 9¾c for Hallett's. We quote old metals as follows: Copper wire, 11⅛c; heavy copper, 11⅛c; light copper, 10¼c; heavy red brass, 11¼c; light brass, 10¼c; red turnings, 9¼c; yellow turnings, 7¼c.

Largest Carrier on the Great Lakes.

A. B. Wolvin, of Duluth, has placed an order with the American Shipbuilding Co. for a steel freight steamer which will be the largest carrier on fresh water. It will be sixty-two feet longer, four feet wider than the steamers John W. Gates, James J. Hill, William Edenborn and I. L. Elwood, which are the largest steamers on the lakes and which are 498 feet overall. The new boat will be 560 feet overall, 540 feet keel, 56 feet beam and 32 feet deep. She will have 33 hatches, with 12 foot centers and will be of special hopper construction, so that she can take on a cargo of ore in an hour and unload in five hours. The hopper construction will permit of so placing the ore that it can be all taken out by the clam shells. There will be quadruple expansion engines with cylinders 18½, 23½, 42½ and 66 inches, with 42 inch stroke. Steam will be furnished by Babcock & Wilcox water tube boilers to be allowed 225 pounds pressure. She will carry 10,000 gross tons on 18½ feet of water and will cost $500,000. The big freighter will be built at the Lorain yard and will be completed and ready for business April 1, 1904.

South Chicago and Conneaut are for the present the only ports that are well suited for discharge of cargo from a vessel of this kind, though she may load at any of the upper-lake ports. It is believed that more of her kind will soon follow, and that other ports will arrange for their accommodation.

Malleable Castings Contracts.

Contracts for malleable castings aggregating a considerable tonnage have been placed in the past two or three weeks, chiefly by harvester and agricultural implement manufacturers. It is understood that prices were somewhat below those which formed the basis of similar contracts last year. The International Harvester Co. has contracted for its outside requirements of malleables, the bulk of the business going to the Northwestern Malleable Iron Co., of Milwaukee. Other agricultural buying has been of fair proportions, but the absence of buying of malleable castings by car works is a matter of comment. While all such works are now fully employed, the business on their books for the coming year is not large, and they are not under the necessity at present of going into the market to cover for their materials.

The International Harvester Co., of Chicago, has, it is reported, purchased the mining interests of the Deering Harvester Co., on the Mesabi range and in the Baraboo district for $3,500,000. When the harvester combine was formed last fall the iron ore division of the Deering company was not included. The purchase includes the Hawkins mine at Nashwauk and the Agnew mine at Hibbing, on the Mesabi range, the La Rue 1 and 2, in the new Baraboo district of Wisconsin, and some properties at Crystal Falls, Mich.

The American Steel & Wire Co. has just contracted with the East Ohio Gas Co. for 2,000,000 feet of natural gas per day for use in its open-hearth department at Cleveland.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.

ROSE BUILDING, CLEVELAND, OHIO.

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JOHN A. PENTON, Vice-President,
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PITTSBURG: 429 Park Building, A. O. BACKERT, Manager.
NEW YORK: 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST: R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

AUGUST 27, 1903

THE COURSE OF BUSINESS AND INDUSTRY.

Manufacturers have been agreed for some time that the flood tide of prosperity which reached such a height last year has shown evidences of subsidence. Attention has been sharply focused for months upon the remarkable decline in stock values. Many have been inclined to refer to these as purely a Wall Street affair in which the manufacturer and tradesman have no interest. That is surely the view it would be pleasanter to take; but from whatever cause, and however much or little related to Wall Street operations, there are already premonitions in the money market that the period of expansion is to be succeeded by conditions suggesting conservatism and more guarded extension of credit. One view of the Wall Street phase of the situation is fairly expressed in the following from an Eastern correspondent:

It is sometimes said that the losses which have been met with in the New York markets since September of last year are paper losses and therefore technical rather than real. There are many hundreds here and elsewhere who would be very glad if an examination of their affairs would prove that the losses they had sustained were mere paper losses. The heavy depreciation in the price of what were first-class securities can be explained upon no other theory than that many persons who were carrying industrials or any new securities were compelled to sacrifice their high grade stocks in order to protect these securities. It has been the lot of rich men and of men of moderate resources. Many rich men can count their losses far up into thousands, and these are not paper losses, either. If, therefore, the aggregate of the losses due to the depreciation of securities reaches up into the hundreds of millions, and much of it represents real loss to many thousands in the United States, it is easy to see that the capacity of these persons to buy is greatly diminished. Therefore, decreased demand for many of the luxuries and even necessaries of life is sure to follow, and it is the impression here that this decrease will be so extensive within the next six months as to affect the domestic markets, if not seriously, at least palpably.

The extract below from the financial comment of the New York *Tribune* bears on the same subject:

The question whether the collapse in stock speculation precedes a like contraction in general trade, is now a subject of general discussion and inquiry. Financial institutions and large commercial houses have been sending out letters of inquiry to their correspondents all over the country, asking if they see any signs of such shrinkage. The general tenor of the replies is that at present only a little hesitation is observable. This is set down first, to doubt engendered by the action of the securities market; secondly, to uncertainty about the outcome of the corn and cotton crops. It might have been predicted beforehand, that this would be the nature of the replies. There is no contraction yet. In the nature of things there could not be; because the drop in the stock market began when business was in full flood; and commercial operations are not set in motion, or arrested, with the rapidity characteristic of stock market movements. Hence Wall Street is always some months ahead of general business, and discounts the expansion or contraction of it in advance, while still there is little or no actual movement. This is the present status of affairs. The prudent business man will not be deceived by this, but will take note that gilt edged commercial paper sells at 6½ percent. This is a sufficient hint.

While there are many elements in the present situation that justify optimism, and no good warrant exists for gloomy predictions, there can be no escape from the settlement that must follow a four years' campaign of reckless promoting. The country is rich and prosperous and good business promises to continue for months. There could be a falling off from the volume of business done in the past twelve months without causing any serious unsettling. But lower prices are already here and diminished employment for labor is a factor to be reckoned with in the immediate future.

COST OF MAKING SOUTHERN IRON.

The recent action of the association furnaces in the South in fixing $12 as a basis for No. 2 foundry at Birmingham, Ala., has aroused considerable interest in the cost per ton of iron at Southern stacks. It has been intimated by a number of operators that rather than sell their product below the $12 basis they would bank or blow out their furnaces, claiming that they could not profitably make iron below the prices recently established. It is entirely probable, however, even with present high labor costs taken into consideration, that iron can be made by the majority of the furnaces in the Birmingham district considerably below $10 per ton. The cost might run up to this figure at a few plants, where modern equipment and appliances are an unknown quantity and where raw materials are bought in the market, but this is the exception and not the rule.

In his testimony before the coal miners' arbitration board, which has just announced its award, J. W. McQueen, of the Sloss-Sheffield Steel & Iron Co., of Birmingham, Ala., stated that iron could not be made in the coming year at less than $8.50 per ton, unless concessions were made by the coal miners. If they should make the concessions desired it was conceded that it might be possible to make iron for $7.50 per ton. One of the large companies operating a number of furnaces in the Birmingham (Ala.) district, is said to have produced iron for a brief period recently at a cost of only $7.05 per ton, and rarely does its cost of production exceed $7.25. It is not stated what royalty charge on coal and iron ore enters into this reckoning.

This factor has grown in recent years, with the appreciation of the market prices of these minerals and the correspondingly higher basis for leases. Present costs of production are exceedingly high as compared with the years of depression in the nineties, when iron was made at a little less than $5 per ton at a few of the Southern stacks, while the highest cost of production was between $6 and $7.

A number of blast furnace operators in their testimony before the arbitration board last week stated that they could not profitably produce iron at present much under $11 per ton. It was not brought out in the testimony, however, what amount per ton was charged for royalties and depreciation. In the case of the furnace referred to above the $7.05 total for producing iron includes an allowance for the exhaustion of coal and ore deposits.

Annual Capacity of New Blast Furnaces 4,447,000 Gross Tons.

The American Iron and Steel Association has gathered and published details of the 32 new blast furnaces which were under construction in the United States on June 30, 1903, the three furnaces long idle which were being rebuilt on that date and one furnace, partly erected, on which work was suspended in 1892, and on which work was resumed in July, 1903. Of the 32 furnaces building, 30, with an annual capacity of 4,197,000 tons will use coke, and 2, with an annual capacity of 145,000 tons, will use anthracite coal and coke mixed. The four revived and partly erected stacks will have an annual capacity of 105,000 tons. Total annual capacity, 4,447,000 tons. A summary of the list is as follows:

New York.—Two coke stacks of Buffalo & Susquehanna Iron Co. at Buffalo (110,000 tons); four coke stacks of Lackawanna Steel Co. (960,000 tons).

New Jersey.—Wharton Furnace No. 3, at Wharton (125,000 tons).

Pennsylvania.—Adrian Furnace of Rochester & Pittsburg Coal & Iron Co., Du Bois (110,000 tons); one furnace of Cambria Steel Co., Johnstown (150,000 tons); two Donora furnaces at Donora (365,000 tons); two South Sharon furnaces (280,000 tons); New Castle Furnace No. 3 (182,500 tons); Clairton Furnace No. 3 (182,000 tons); Eliza Furnace No. 5 of Jones & Laughlin Steel Co. (145,000 tons); Palmerton Furnace of New Jersey Zinc Co. at South Bethlehem (20,000 tons).

Virginia.—One stack of Low Moor Iron Co., at Low Moor (60,000 tons).

Alabama.—Alabama Steel & Wire Co. furnace at Gadsden (110,000 tons); Central Iron & Coal Co. furnace at Tuscaloosa (60,000 tons); Ensley Furnace No. 6 of Tennessee Coal, Iron & Railroad Co. (100,000 tons); furnace of Alabama Consolidated Coal & Iron Co., Gadsden (75,000 tons); furnace of Lookout Mountain Iron Co. at Battelle (100,000 tons); Woodward Iron Co. furnace at Woodward (100,000 tons).

Ohio.—Cleveland Furnace Co., Cleveland (120,000 tons), La Belle Furnace, Steubenville (125,000 tons); two Lorain Steel Co. furnaces (300,000 tons); Ohio Furnace No. 4 at Youngstown (182,500 tons).

Illinois.—South Chicago Furnace No. 2 of South Chicago Furnace Co. (125,000 tons).

Michigan.—Detroit Iron & Steel Co.'s furnace (100,000 tons).

Colorado.—Furnace F at Pueblo (130,000 tons).

The revived or partly erected furnaces are as follows: Standish furnace at Plattsburgh, N. Y. (25,000 tons); Secaucus furnace of Eastern Iron Co. at Secaucus, N. J. (27,000 tons); Fosters Falls Furnace of the Virginia Iron, Coal & Coke Co., in Virginia (3,000 tons of cold blast charcoal iron); Union Furnace No. 2 at Big Stone Gap, Va. (50,000 tons).

In commenting on the situation the *Bulletin* says:

Summarizing the details given, it is found that of the 32 furnaces which were being built on June 30, 1903, 17 stacks, with a total annual capacity of 1,917,000 tons, are to be blown in during 1903, and 15 stacks, with an annual capacity of 2,425,000 tons, are to be blown in during 1904 or very early in 1905. Of the three old furnaces which were to be revived on June 30, 1903, one furnace resumed blast early in July and the remaining furnaces are to blow in very shortly. The annual capacity of these three furnaces amounts to 55,000 tons. The partly erected stack, which will not be completed until 1904, will have an annual capacity of 50,000 tons. Adding the capacity of the building furnaces to the capacity of the partly erected and revived furnaces it is found that by the close of 1903 the productive capacity of the completed furnaces in the country will be increased to the extent of 1,972,000 tons, and that by the close of 1904 it will be further increased by 2,475,000 tons, or a total increase in the next 18 months of 4,447,000 tons, divided as follows: coke, 4,247,000 tons; anthracite coal and coke mixed, 172,000 tons; and charcoal, 28,000 tons.

Through correspondence with the owners of the furnaces above described, we have ascertained that of the 1,972,000 tons of additional capacity credited to 1903, 905,000 tons will be for sale in the general market and 1,067,000 tons will be for the use of the makers, while, of the 2,475,000 tons credited to 1904, 405,000 tons will be for the general market and 2,070,000 tons for the use of the makers. Of the grand total 1,310,000 tons, or 29.5 percent, will be for sale, and 3,137,000 tons, or 70.5 percent, will be for the use of the makers. Practically all of the pig iron intended for the use of the makers will be consumed in the manufacture of Bessemer and open-hearth steel, while the greater portion of the pig iron intended for the general market will be used in the manufacture of iron castings, muck bars, etc.

The above statement relates solely to furnaces under construction on June 30, 1903, to old furnaces about to be revived on that date, and to the single partly erected furnace in Virginia on which work was resumed in July. Furnaces projected on June 30, 1903, or new furnaces for which ground has since been broken, if any, are not included. Nor are furnaces which are being rebuilt in whole or in part included.

Total Blast Furnace Capacity.

On November 1, 1901, the total annual capacity of the completed blast furnaces in the United States amounted in round numbers to 24,812,000 gross tons. On the date named there were 12 new furnaces being built, several of which had been completed and blown in prior to June 30, 1903. In addition 5 new furnaces for which ground had not been broken on November 1, 1901, were completed and in operation on June 30, 1903, a number of old furnaces which had long been inactive had resumed work, and several furnaces which were active on November 1, 1901, had since been rebuilt and their capacity largely increased. Allowing for all the additions above noted we estimate the annual capacity of the completed blast furnaces of the country on June 30, 1903, at 26,600,000 gross tons. If to these figures be added the annual capacity of the furnaces under construction on June 30 and of the old furnaces which were to be revived on that date a grand total of over 31,000,000 tons is reached as the approximate total yearly pig iron producing capacity of the country on December 31, 1904, when practically all the furnaces under construction on June 30, 1903, are to be ready for blast. In the above calculation due allowance has been made for all furnaces which were classed on November 1, 1901, as likely to be some day active but which have since been abandoned or dismantled.

The capacity given above is of course largely conjectural, as it would be simply a physical impossibility for all the blast furnaces of the country to be operated at the same time. The figures serve, however, to show the total quantity of pig iron that could be made in a year if the operation of all the furnaces in the country for every day in the year were practicable. Under any circumstances we could make 24,000,000 tons next year if that quantity were needed.

The West End Furnace Co., Roanoke, Va., has announced its intention of closing its plant on account of the low price of pig iron. The furnace has been using a mixture of Lake ore and Virginia ore.

The Hague correspondent of the London *Telegraph* reports that negotiations have been opened by an American syndicate with a view to acquiring the great steel and iron plants recently built at Terneuzen, near the Belgian frontier.

The Labor Situation.

BIRMINGHAM COAL STRIKE SETTLEMENT.

The arbitration commission in the controversy between the coal operators and miners in the Birmingham, Ala., district, over the wage scale and contract for the current year, made its award last week after a session of two weeks. The findings of the arbitrators were unanimous. The chief matters decided by the board were in regard to the wage scale, which the award advanced 2½ cents on both the maximum and minimum, making it 47½ cents and 57½ cents, as against 45 cents and 55 cents last year. A semi-monthly pay day is established with non-transferable checks. The scale for narrow work based on the Pratt seam is reduced 13 cents per yard, or from $2.84 to $2.71. Thomas G. Bush and Edward Flynn were appointed a committee to adjust the differential between pick and machine mining in the mines of the Alabama Consolidated Coal & Iron Co., and Charles McCrery and Edward Flynn a similar committee for the Tennessee Coal, Iron & Railroad Co. mines. Boys under 14 years must not be employed in the mines after Sept. 1.. The award of the commission is considered a fair compromise and no victory can be claimed by either party in the controversy.

The eight-hour day was refused. Fines were provided in the case of miners absent from work more than half a day on pay day, or absent the day after pay day, or for two consecutive days at any time during the month when the mine is in operation, except in case of sickness or after notifying and obtaining the consent of the mine foreman. For the first offense in any one month the miner will be fined fifty cents or suspended two days, and for the second offense in the same month, fined one dollar or suspended four days. Men who do not work 20 days in any one month when the mine is in operation 20 days or more, unless absent by reason of sickness or with the consent of the mine foreman, shall be fined the sum of $1 or suspended the first six days in the following month, or be assigned to another working place.

Any man absent from work one day without notifying and obtaining the consent of the mine foreman, except in case of sickness, shall be fined for the first offense in any one month 50 cents or be suspended for two days, and for the second offense in the same month shall be fined $1 or suspended for four days.

The figures governing the prices to be paid on the sliding scale have been slightly changed, making the 55-cent basis on $10.50 iron as against $11.00 heretofore. The minimum rate of 47½ cents is on $8 pig iron. The board heard testimony last week from the miners in rebuttal, such testimony tending to show that some of the miners reported to be earning the largest wages, according to testimony introduced by the operators, were working their sons with them, or other boys 12 to 15 years of age. They also introduced considerable testimony as to the commissary and check system and the discounting of these checks before pay days. It was agreed during the submission of testimony that hereafter no boys under 14 years of age would be allowed to work in the mines.

The claims of the miners coming within the scope of the arbitration were decided to be: (1) That there should be an increase of 5 cents per ton on the minimum and maximum of the then existing sliding scale, with a proportionate increase to day men and for narrow work. (2) An eight-hour day. (3) A semi-monthly payment of wages and earnings.

The claims of the operator decided to be within the scope of the arbitration were: (1) A readjustment of rates for narrow work. (2) An adjustment of the differential between machine work and pick work. (3) The establishment of a minimum number of days per month in which a miner shall be required to work. (4) A readjustment of day wages. (5) A readjustment of the difference of the wage scale between Pratt and other mines.

The commission was composed of Judge George Gray, of Delaware; T. L. Lewis, national vice president of the United Mine Workers of America; William R. Fairley, Alabama member of the executive committee of the same organization; Robt. H. Pearson, vice president of the Central Coal & Coke Co., and Charles McCrery, vice president of the Tennessee Coal, Iron & Railroad Co.

THE UNION AND THE SHEET MILL SITUATION.

As predicted in these columns last week, President Shaffer, of the Amalgamated Association of Iron, Steel & Tin Workers, has decided to call a convention of the sheet mill lodges of the association for the purpose of passing upon the advisability of declaring all the non-union sheet mills of the American Sheet Steel Co. open mills. The current number of the *Amalgamated Journal*, the official organ of the Amalgamated Association, contains the following editorial:

"The condition of the sheet trade is a deplorable one. At a season of the year when business should be at its best there is every evidence of dullness in the sheet trade and most of the mills are doing but little work. The mills of the American Sheet Steel Co., both union and non-union, are running by fits and starts, and most of the independent mills are doing little or nothing. The condition of many of the workmen who have been standing the brunt of the unfavorable working conditions that have existed in the trade during the past two years is one that is really grave, and if there is any way that the association can relieve the stress of circumstances it ought to be done. But how can it be done, is the question. Some claim if all the non-union sheet mills were thrown open the strain would be relieved, for then union men could honorably accept positions in any mill where the union price was being paid. Others claim that the limit of output on sheet mills will have to be abolished before the union mills will be in a position to command a fair share of the trade.

"The modification of footnote No. 5 of the tin scale at the last tin conference, allowing black sheets 14¼ square feet and under to be rolled on tin mills at tin mill prices and output of limit has intensified the already stringent conditions that prevailed in the sheet trade. These are burning questions that are being much discussed by the sheet mill members of the association. Delegations of sheet mill workers have visited the national office, appealing that something be done along these lines in order to bring relief if possible. President Shaffer during the coming week will send a circular to the sheet mill lodges bearing on this situation, and suggesting that the sheet mill lodges meet in conference to grapple with it."

(Special Telegram.)

PITTSBURG, Aug. 26.—A conference of the delegates of the sheet mill lodges of the Amalgamated Association will be held in this city commencing with Monday, Aug. 31. It will discuss both the removal of the limit of output for union sheet mills and the opening of all non-union mills in the country to sheet mill workers affiliated with the Amalgamated Association.

The independent union mills claim that with the present limit of output the American Sheet Steel Co. is enabled to make sheets at a less cost than they can, at its non-union mills where there is no limit to the output. On sheets of extreme lengths the present limit is sufficient, but in the shorter lengths the independent mills claim that the limit should be increased or removed entirely. The present Amalgamated scale of wages is based on 180 pairs per turn for single mills, and No. 25 gauge and lighter, doubled in pairs, 96 pairs per turn; doubled in threes, 105 pairs per turn. Single iron, 14 to 19 gauge inclusive, 105 pairs. The limit of output on three-turn mills is nine heats and on two-turn mills 10 heats. Mills that do not double 20 to 24 gauge, to work at the ratio of single iron mills, 180 pairs. Doubling over iron on single mills is done at the same ratio as on doubling mills.

The present idleness of many union mills of the American Sheet Steel Co. has thrown a large number of sheet workers out of work and to enable them to secure positions it is probable that the non-union mills, not only of the American Sheet Steel Co., but of the independents as well, will be thrown open to Amalgamated men.

The Cambridge mill of the American Sheet Steel Co. was erroneously given in our last issue as a non-union mill. It is under the control of the Amalgamated Association. Of the 164 mills of the American Sheet Steel Co. 73 are union and 91 are operated non-union.

BLACKSMITHS' AGREEMENT AT NEW YORK.

(Special Correspondence.)

NEW YORK, Aug. 25.—The New York Metal Trades Association made an agreement yesterday with the blacksmiths and

blacksmiths' helpers, which goes into effect Sept. 8 next, for the term of one year, and maintains the existing wages paid to blacksmiths; grants an increase of five percent to blacksmiths' helpers receiving $2 a day or less, and establishes working rules. The agreement is practically in the same form as that made by the association with the boilermakers and other labor organizations, and attempts to establish peaceful means for the settlement of trades disputes, without resort to strikes or lockouts. The contract specifically states that there shall be no strike or lockout during the term of the agreement.

Not the least important result of the conference was the action taken by the association with the blacksmiths, in adopting a uniform apprenticeship system. At present the apprenticeship system is in a very unsatisfactory state. An apprentice frequently leaves the service of an employer to whom he is indentured before he has completed his trade, and enters the employment of another employer as a full-fledged blacksmith. By the co-operation of the two organizations it is believed that this evil will be cured and such action will be for the benefit of the apprentice in making him a better mechanic, and for the trade generally in providing more skilled mechanics.

The blacksmiths and blacksmiths' helpers entered into an agreement with the New York Metal Trades Association nearly a year ago. These were the first labor organizations with which the association made agreements, and the arrangement proved so satisfactory to both organizations that no difficulty was encountered in making a new one for the ensuing year.

In regard to the rumored sympathetic strike of all the trades employed in the ship yards to enforce the machinists' demands, it is stated that the members of the New York Metal Trades Association have never anticipated such action by the blacksmiths or boilermakers, or any other labor organization with which the association has agreements providing that there shall be no sympathetic strike. The ground of their confidence in the integrity of these organizations is demonstrated by the result of the negotiations yesterday with the blacksmiths and blacksmiths' helpers.

LABOR NOTES.

South Wales steel workers have suffered a reduction in wages of 4 percent as from July 1, under the sliding scale audit.

Confident the backbone of the opposition has been broken, the Building Trades Employers' Association of New York has decided to drop all negotiations with the Housesmiths and Bridgemen's Union. Whether the union agrees to accept the plan of arbitration or not, it will no longer be recognized by the employers. Another union of iron workers has been formed and more than 1,000 men have already joined it.

The striking iron molders at the foundry of the Poole Mfg. Co., Woodberry, Md., have returned to work. It is understood that a compromise was effected.

Coremakers in the St. Paul Foundry and the American Hoist & Derrick Co., St. Paul, Minn., went on a strike on Aug. 18, and say that as soon as the union-made cores now on hand are used the molders will join and tie up the shops.

About 400 men are idle at the Continental Pipe Mills of the National Tube Co., Pittsburg. The strike was ordered because the annual wage scale has not been signed. The Continental plant has been running steadily for ten years and the action of the men in quitting was a surprise to the management, as the delay in signing the scale is attributed to the absence of the general manager. A speedy settlement is expected.

The strike of the sheet workers at the plant of the Ashland Sheet Mill Co., Ashland, Ky., has been called off by President Shaffer, of the Amalgamated Association of Iron, Steel and Tin Workers. The men returned to work under the terms prevailing before the strike was declared.

The demand of the machinists of the Youngstown, O., district for an increase in wages has been compromised, the manufacturers granting them 5 percent increase instead of the 7½ percent asked. The manufacturers have the option of calling the agreement off in five months, provided market conditions do not warrant the payment of this increase. In the adjustment of the scale the night men secure an advantage, inasmuch as they will receive 14 hours' pay for 13 hours' work. The first demand of the machinists was for a straight advance of 15 percent.

LAKE SUPERIOR IRON MINES.

At the great Pioneer mine of the United States Steel Corporation, at Ely, Vermillion range, they have in stock 90,000 tons, left over from last winter. The pile held 210,000 tons at the opening of navigation. Total shipments from this mine for the season to date have been about 350,000 tons and for the remainder of this season they will be about 325,000 tons more. The company is about to erect an immense steel shafthouse at its new steel-lined, incline shaft B. It will be an all-steel, two compartment and ladder road structure, 168 feet high, with arrangements for sorting of ores as they come down, and with ample pocket storage capacity. It is a trifle larger than the houses at Sibley and Savoy mines and of the same general plan, though modified according to conditions and improved as experience suggests. The superstructure will be built by the American Bridge Co., and the foundations are completed. Five-ton skips will be used for hoisting, and the engines, which are to be generally similar to those put in a year ago at the Sibley-Savoy, are to run at a speed of 2,000 feet per minute. Shaft D is now down 1,068 feet, to the 12th level, and two new levels are being opened in ore. A new and large pumping plant is to be installed to care for the entire mine. A boiler and engine house covering about 5,250 feet of ground is under way and a stack 125 feet high is going up. At this engine house will be two 26 by 60 Corliss engines operating 12-feet direct motion winding drums, at speed to hoist the balanced or unbalanced 5-ton loads 2,000 feet per minute. Steam will be furnished by three 150-h. p. return flue tubular boilers, each 70 by 216 inches. The machinery plant will cost a little less than $100,000 and is an indication of what the Pioneer mine is to be.

The deep vertical shaft at the Steel Corporation's Zenith mine, adjoining the Pioneer, at Ely, is now being sunk very fast and will be completed some time next year. The mine is shipping more ore this year than ever before and is opening up wonderfully well underground.

No. 3 shaft at the Clark mine, Mesabi range, is in ore. It goes to 200 feet. No. 1 is to be abandoned and all ore is to be shipped from 2 and 3. No. 1 shaft ships over the Great Northern, as does No. 1 of the adjoining Chisholm. No. 2 at the Chisholm will soon be a shipper, over the D. M. & N. road.

The ore washing plant at Arcturus mine at the West Mesabi range is about ready to operate. It is believed that the plant will operate successfully and that there sandy ores can be economically treated.

E. F. Sweeney has been operating eight drills on the Western Mesabi, but has reduced the number to six. When iron matters look more promising to him the number will be increased again.

The Lewis Exploration Co. has been formed on the Mesabi range to explore a number of tracts that have been secured under options. Several of these are near the Buckeye, at the extreme west end that M. L. Fay has explored unsuccessfully, and others are in the extreme eastern end of the range in section 1 T 59 R 14, on Silverman lands, which have also been explored on various occasions.

Railroad storage and switching yards at Ely, at both the Chandler and Pioneer mines, will be entirely remodeled and much enlarged at once. A large rock cut is now going on for the Chandler enlargement.

Drills have been put to work on section 25, east of Ely, and near where several costly explorations had resulted unsuccessfully in past years. The drills are now quite a way down in greenstone.

The Tesora Mining Co., which has heretofore confined its work to the Mesabi range, has started drilling operations on the west side of Long lake, west of the Chandler mine. So far, it is reported, nothing of value has been found.

A large automatic hoisting plant, somewhat similar to that at Sibley-Savoy, at Ely, will be installed next year at the Aragon mine.

Capt. Gustave Anderson, who has had underground charge at Ashland mine, at Ironwood, is put in charge of Negaunee mine, when the Cleveland-Cliffs Co. takes hold, next Thursday. The entire sum of $1,500,000 bonus, to be paid for the lease of this mine, has been paid over.

Dr. J. A. Holmes, chief of the mines and metallurgy department at the St. Louis fair, is in the iron region collecting data and arranging for exhibits. He says: "First, the exposition will lead in its recognition of the industrial side of life. So mining will have especial prominence. We shall devote our space to iron, with Minnesota and Michigan leading; to coal, and an actual coal mine in the exposition grounds will be working, for coal has been found underlying the site; to copper, with an artificial copper mine in operation, and with Montana, Michigan and Arizona as chief exhibitors; to lead and zinc; to gold and silver, etc. Oil drilling will be shown in actual operation, for it is hoped that oil may be found in the exposition grounds."

COLORADO FUEL & IRON CO. MEETING.

Col. Frank J. Hearne, formerly president of the National Tube Co., was elected a director of the Colorado Fuel & Iron Co., at the annual meeting of the stockholders held at Denver, Col., on Aug. 19. At the meeting of the board of directors to be held next week in New York, Mr. Hearne will be elected either president or chairman. The stockholders elected the following directors: John C. Osgood, Julian A. Kebler, Geo. J. Gould, John D. Rockefeller, Jr., F. J. Hearne, Frederick T. Gates, E. H. Harriman, Edwin Hawley, Benjamin Nicolla, J. H. McClement, James H. Hyde, E. W. Oglebay and E. Parmalee Prentiss.

On the same day the annual meetings and election of officers of the following subsidiary companies of the Colorado Fuel & Iron Co. was held: The American Fuel Co., the Minnequa Town Co., the Steel Wheel & Wagon Co., the Crystal River Land & Improvement Co., the Redstone Improvement Co., the Crystal River Railroad Co., the Colorado & Wyoming Railway Co., the Rocky Mountain Coal & Iron Co., the Pueblo Realty & Trust Co., the Laramie Iron & Steel Co., the Minnequa Cooperage Co., and the Rocky Mountain Timber Co.

Mr. Hearne returned this week to Pittsburg from a three weeks' inspection tour of the properties of the Colorado Fuel & Iron Co. He is enthusiastic over the future of the company and expressed himself as follows: "The future of the Colorado Fuel & Iron Co. is very bright. The plants are modern, just as good as any in existence; the company has immense advantages in the way of raw material, and controls all of that great territory between the Missouri river and the Pacific ocean and Canada and Mexico. The West is growing very rapidly, and the demand for iron and steel products is enormous. Everything there in a business way appears favorable, and I look for a very brilliant future for the company. It is our intention to employ as far as possible men of Colorado in the operation of the plants, but it may be that for some men we shall be compelled to go elsewhere. Nothing, however, has been decided on that point. The company now employs 17,000 men in all of its departments, and the works and interests are being expanded rapidly.

"The coal properties of the Colorado company are tremendous. It has 600 square miles of the finest kind of coal, easily accessible from the steel plants and blast furnaces, the coal being of all grades of anthracite and coking and non-coking bituminous. One tract alone is 250,000 acres in extent and it has 35 miles of railroad opening it. There are in operation now 39 large mines and 3,500 coke ovens. The company has large deposits of iron ore of good quality and is protected in every way in its supply of raw material.

"The company has 178 miles of railroad of its own, five blast furnaces in operation and one now under construction. These are large, modern furnaces. The railroad mileage of the West, the legitimate territory of the company, is something enormous and because of the location and ownership by the company's control the Colorado Fuel & Iron Co. will have the first call on this great rail tonnage. It now makes between 1,500 and 2,000 tons of steel rails a day, the mill being a splendid one, only recently built.

"In fact, all of the plants of the company are virtually new and they have been well built. All of the old machinery has been torn out and only the latest types used. This has resulted in the greatest possible economies. Six basic open-hearth furnaces of 50 tons capacity each have just been started, and one of the finest rod mills in the country was started only three or four weeks ago. The material for the other rod mill is on the ground and it will be erected within a short time.

"The wire drawing and wire nail mills are partly erected and the machinery and buildings for a modern tinplate plant are ready for erection. It will not be long until the costly improvements have been completed and the big plant is perfect.

"The Colorado company, in addition to supplying its own plants with fuel, is a large seller of coal and coke, its annual output being between 6,000,000 and 7,000,000 tons. The profit on the coal and coke alone pays the fixed charges of the company. The company is an immense tonnage producer for the railroad properties of Mr. Rockefeller and Mr. Gould, who control the Missouri Pacific and the Denver & Rio Grande, and also for other railroads. The freight bills of the company alone are $1,250,000 a month. I am very much pleased with the plants as I saw them. They are as good as any to be found anywhere. The company's management is harmonious and the control of Mr. Rockefeller and Mr. Gould assures a continuance of its prosperity. The company will not be antagonistic to the United States Steel Corporation, but friendly to it, although it will be entirely independent of that corporation. There is no occasion for any antagonism."

SPEEDS OF OVERHEAD AND OTHER CRANES.*

BY A. P. HEAD.

Cranes may be defined as instruments for lifting loads and moving them to another place. The hook of the crane must, therefore, have both vertical and lateral movement, and the method by which the latter is obtained gives a means of classifying cranes. Cranes may be classified as follows:

1. Fixed cranes, comprising:

(a) Fixed Jib Cranes, having rotary or slewing motion, with or without derricking to vary the radius.

(b) Fixed Rotary Cranes, having a trolley which can be racked in or out on a horizontal track, to vary the radius.

2. Moving Cranes, comprising:

(c) Overhead Traveling Cranes, having lifting, cross-traversing, and longitudinal-traveling motions.

(d) Gantry or Goliath Cranes, identical with (c) except that the bridge rests on the ground by legs instead of on an overhead runway.

(e) Centilever Cranes, being identical with (d) except that the supports are at the center instead of at the extreme ends, and run on a track of a moderate gauge.

(f) Locomotive Cranes, generally steam-driven, being identical with (a), except that they travel on a track.

There are many combinations and variations of these types. The motive powers which may be used comprise: flying rope, square shafting, steam, hydraulic power, and electricity. The first two may be dismissed as already superseded; steam power is not chiefly used for "locomotive" cranes, with a wide radius of action. Where movements are sufficiently restricted to be always within range of a central power-generating plant, hydraulic and electric power are largely used. Electricity is rapidly displacing all other forms of power transmission for cranes. Its advantages over hydraulic power are: its greater economy, ease of transmission, flexibility, and less liability to trouble from changes of temperature. The advantages possessed by hydraulic power of greater simplicity and precision are being rapidly neutralized by improved electrical appliances and methods of manufacture. The author will therefore, deal almost exclusively with electric cranes.

The most suitable form of electrical energy is continuous current at 220 volts to 500 volts. This is superior to alternating current, on account of the greater starting-torque and acceleration given by the former. The operations of a crane involve a rapid succession of startings and stoppings; continuous running occupies an unimportant fraction of the time, and loads are very variable. Alternating-current motors, while efficient at full loads, can only have a strong starting-torque at the expense of efficiency. Continuous current, on the other hand, admits of easier regulation of motors, is cheaper in wiring, and can be stored in batteries to equalize a variable load. Series-wound motors, which automatically run faster with lighter loads, should be used if they are coupled permanently to the gearing. They should withstand 100 per cent. overloading for short periods, and much lighter overloads momentarily without damage, which conditions are fulfilled by the ordinary tramway type. Where motors run continuously with clutch-connections to the gearing, they should be shunt-wound.

The proper speeds for a crane depend on the purpose for which it is intended. The ideal condition is rapid acceleration, uniform motion at a high speed, and quick slowing down. Rapid acceleration can be employed by employing series-wound motors, if permanently coupled, or the inertia of a continuously-running motor if working through clutches. Quick stopping is effectively achieved by an electric brake working on the armature shaft, operated by a weight or spring, and taken off by a solenoid in series with the motor. Such a brake is of almost universal application to the hoisting motor, and serves not only to prevent the load accidentally running down, but to stop the motor quickly, giving to the motion the exactitude and precision characteristic of hydraulic cranes. Most cranes are fitted with an additional mechanical brake, which prevents the load descending fast enough to drive the motor. We will now deal with the different designs of cranes seriatim.

*Read at the Engineering Conference of the Institution of Civil Engineers, London, Eng.

(a) Fixed Jib Cranes.—With these may be included those mounted on a carriage, and having slow traveling motion not in constant use. Great speeds are necessary when jib-cranes are used for loading and unloading ships. In the latest practice, hoisting is done by the hoisting-motor through a friction-clutch, and lowering by the footbrake. An electric brake stops the motor when the current is cut off, but the hoisting-drum is disconnected, and lowering is accomplished independently of the motor, which need not reverse. In a typical 3-ton dock-crane of English make, the cycle of lifting, slewing, lowering, and slewing back is performed in 43 seconds. In another recent instance of a 3-ton crane, the lifting speed is 150 ft. per minute, and the slewing speed is three complete revolutions perminute. Derricking is more common in England than abroad, and may be done at slow speeds by a small motor. A single hoisting-rope is preferable for operating light loads quickly. Slewing is done by a separate motor.

(b) Fixed Rotary Cranes.—These are usually for heavy loads where speed is unimportant.

(c) Overhead Traveling Cranes.—These are used in steel works, engineering shops, foundries, etc., and should have a separate motor for each of the three motions, controlled by an operator at one end of the bridge. If lateral motion is effected by a continuously-running motor and clutch-gear, the suddenness of starting sets up swinging of the load, which is obviated by the more gradual acceleration of separate motors. The longitudinal traveling is usually the quickest motion, as the distances covered are relatively great. If the load is habitually lifted by a sling, and if a single slinger is employed, the longitudinal speed is limited by the speed at which he can walk from one point to the other, and it is useless to exceed this. Assuming the slinger to walk at 4 miles per hour, or 350 feet per minute, he should start as soon as the load leaves the ground, and should be at the depositing point when it nearly touches the ground. His presence is unnecessary during most of the acutal lifting and lowering. The crane, should therefore, travel faster than the man, and should overtake him half way. The maximum useful speed is thus 400 feet or 450 feet per minute, depending on the average run. With a practiced operator, cross-traversing takes place simultaneously with longitudinal traveling, and occupies no extra time.

In the latest American practice two slingers are employed, one at each end of the shop, rendering much higher speeds possible. In one instance, longitudinal travel is at the rate of 800 ft. per minute, and cross-traversing at 250 ft. per minute.

If the crane is of large capacity, an auxiliary hoisting-drum or an independent trolley for light loads, saves both power and time. Below are given the speeds of typical modern cranes for shop purposes, by both English and American makers, and indicates that English speeds are still considerably below American.

TABLE No. 1.

SPEEDS OF ELECTRIC OVERHEAD CRANES—SUNDRY ENGLISH MAKERS.

Lifting Capacity	Speed with Full Load in Feet per Minute			
	Hoisting		Cross-Traversing	Longitudinal Traveling
	Main	Auxiliary		
Tons	ft. in.	ft.	ft.	ft.
100	3 6	14	50	80
100	2 0	7	50	60
50	6 0	24	70	125
50	3 0	30	40	80
40	3 0	...	50	80
20	10 0	40	100	200
10	10 0	...	60	150
5	20 0	...	60	150
3	30 0	...	60	150
3	30 0	...	100	325

A mechanical efficiency of 66⅔ per cent. in the lifting mechanism may be assumed with good workmanship, and if only spur-gearing is used. Worm-gearing reduces this by about 10 per cent under the best conditions, and is popular in Germany, although not considered good practice in England or America. Longittudinal traveling is much accelerated by having smooth runway tracks, which should be designed to resist lateral stresses equal to one-fifth the capacity of the crane. The bridge itself should be designed to resist lateral stresses equal to one-fourth the capacity of the crane.

The longitudinal and cross-traversing gears are sometimes provided with electric brakes to prevent over-running, thus imparting a feeling of confidence to the operator and enabling him to work at higher speeds. In calculating the brake horsepower of these motors, a tractive force of 50 lb. and 35 lb. per ton of total weight should be assumed for longitudinal and cross-traverse respectively, assuming level tracks and spur-gearing, and reasonably large track-wheels.

(d) and (e) Gantry and Cantilever Cranes.—These differ chiefly in the gauge of the ground track and the consequent design of the bridge, the former being wide and the latter narrow-gauge. They are generally of large dimensions, and are used for moving materials from one point to another in an open space, or for shipbuilding purposes. The mechanism is arranged on either of two systems. In the first, the operator's cage is attached to the main structure, and contains one motor with reversing clutches for operating the various drums, motion being transmitted by ropes. This gives a light trolley, with power to start and stop almost instantaneously, and rapid motions in all three directions. But the complication of ropes is an objection, and the operator is badly placed for overseeing the work. In the second system the operator's cage is on the trolley, and he is always over the hook. This does away with all ropes except for lifting, but makes the trolley heavy, owing to the weight of the two motors and gearing. The whole structure must, therefore, be stronger. Opinion is divided as to which system is the better.

The following speeds are typical of a shipbuilding cantilever crane actuated by ropes and clutches. Hoisting speed, with 13 tons, 125 ft. per minute; with 4½ tons, 350 tone per minute; with ½ ton, 750 ft. per minute; trolley traverse, 400 ft. to 800 ft. per minute, according to load; longitudinal travel, 400 ft. to 700 ft. per minute. In some cases the trolley traverse reaches 1,200 ft. per minute, and the longitudinal travel 900 ft. per minute.

The following speeds are typical of a 5-ton yard cantilever crane of 200-ft. span, with a motor for each motion, and two out of three motors and gears carried on the trolley. Hoisting speed with full load, 100 feet per minute; longitudinal traveling, 300 feet per minute.

For shipbuilding and other purposes, where the longitudinal traveling is important, the author suggests that better service at less cost may be obtained by two or more light rapid cranes, of small capacity, on parallel overhead runways.

Gantry cranes, with or without an added cantilever, are largely used for unloading minerals in buckets from ships or stock piles, and are made in England, America and Germany. Longitudinal travel need not be rapid, being seldom used; but lifting and cross-travel are very rapid, and are operated by one motor through cluetches and ropes. The bridge is frequently inclined towards the ship or picking-up point in order to use gravity, assisted by a counterweight and tail-rope, the speed being checked by a foot-brake. Remarkable speeds are obtained by these means. A complete cycle of operations, including delivery of the bucket to the end of a 200-ft. bridge, can be performed in one minute. The speed of the trolley uphill with full bucket is 800 feet per minute, and the return speed downhill is 1,000 feet per minute.

The Brown Hoisting Machinery Co. has constructed ore-unloading machinery at West Superior, having an automatic grab-bucket of 1¼ tons capacity. The lift is 40 feet, and the delivery point is 150 feet from the wharf edge. A complete cycle of operations is performed in 30 seconds, and 1,000 cycles have been done in 10 hours, including moving the machine from hatch to hatch.

A new development in America is to fit such gantry cranes with independent motors and a "man-trolley," which carries the operator and also the hoisting and traversing motors and gears. In one plant now being constructed, the trolley is designed to support a grab bucket of 8 tons capacity for iron ore. The trolley will weigh 35 tons, and will carry machinery of 500 horsepower. It is intended to travel on a horizontal bridge at 1,000 feet to 1,200 feet per minute, and to hoist at the rate of 300 feet to 350 feet per minute.

A still later development is to place the operator on the trolley, but without any driving mechanism. All motors, gearing, drums, and controllers are situated in a house attached to the main structure. The operator, from his position on the trolley, works the controllers through miniature con-

trollers, somewhat after the manner adopted in an electric elevator. By this system the combined advantages of a light trolley and perfect supervision of his work by the operator are obtained.

(*f*) *Locomotive Steam Cranes.*—These are largely used and deservedly popular, because of their mobility on an ordinary track without electrical connections. The boiler is used as a counterweight, and one pair of engines operates the lifting, slewing, derricking and traveling motions through clutches. Typical speeds of such cranes of American manufacture are given in Table No. 2.

TABLE No. 2.

SPEEDS OF LOCOMOTIVE CRANES (AMERICAN).

Lifting Capacity	Speed with Full Load in Feet per Minute		Speed of Slewing Complete Revolutions per Minute
	Hoisting	Traveling	
Tons			
3	135	520	6
5	75	460	5
10	42½	500	4
20	25	300	2½

American Practice.—The usual American practice for shop cranes is: longitudinal traveling, 300 to 450 feet per minute; cross-traversing, 100 to 150 feet per minute; and hoisting, 10 feet to 50 feet per minute according to the capacity.

Discussion.

Thomas Matthews appeared as a crane user and not as a crane maker, and he would therefore have been glad for more information on certain details. It was desirable that cranes should be run at the duty for which they were designed, otherwise full efficiency would not be obtained. His experience was in their use in connection with machine tools where the lift was not very high. The efficiency of 66⅔ percent mentioned in the paper gave a very paying return, but it was not generally reached. The design should be such that the motor and gear would suit the economical load, and he quoted figures which had been given in a paper read before another technical institution, in which it was shown that the efficiency goes down as the load increases. The author had made reference to an electrical brake, and he, the speaker, found difficulties arise from the adjustment of such a brake being too fine, so that it could hardly be taken off.

Mr. Ellington thought that the term "overhead traveling cranes" was apt to be misleading. He considered that if the word "traveler" was used, it would differentiate them from cranes proper, such as were fitted with revolving jibs. He agreed with the author that for travelers electrical driving was best, but he was not prepared to endorse a statement that electricity would be best for jib cranes, even those to be moved for short distances occasionally; different conditions, however, would have to be considered with regard to this matter. He was very much surprised to find an efficiency of 66 percent claimed by the author, especially as the motors were not of large size. Before hydraulic and electrical installations for cranes could be compared with regard to efficiency, the class of work would have to be considered; for instance, to lift coal the work would be constant, and then hydraulic power would be more effective. Under these circumstances an efficiency of more than 66 percent could be attained; in fact, he had reached 70 percent. For general purposes, however, with no double-power arrangement, efficiency would fall very low. The real foundation of the successs of the hydraulic crane was in the accumulator, and that was a point very often unconsidered. It had been suggested that electrical accumulators might be used, but he thought it would be agreed that if recourse had to be made to such appliances, there would be very few electrical cranes used. The value of the hydraulic accumulator was, of course, that if the work were intermittent a smaller installation of pumping machinery would suffice. He could have wished that the author had dealt with the commercial value of speed. There was very little precise information on that point, which was one of great practical importance.

Prof. Jamieson gave details of trials which had been made at Glasgow with two cranes—one actuated by hydraulic power and the other by electricity—employed in discharging cargo. With a loan of one ton the cost by hydraulic power for discharging 1,000 tons was 48s. 3d.; with the electric crane it was 15s. 11d. For 2-ton loads the respective costs were: hydraulic, 25s. 5d.; electric, 16s. 2d. For 2½-ton loads hydraulic power cost 20s. 6d.; electric power, 16s. 1½d. For 3-ton loads the hydraulic crane cost 17s. 2d., and the electric crane 16s. 6½d. The tests were made to settle whether hydraulic or electric cranes should be used, and it was concluded that the hydraulic crane was not in the running.

Tannett Walker asked when the cranes were made, and Prof. Jamieson replied that the hydraulic crane was made in 1897, and the electric crane in 1902. Mr. Walker, continuing, said the comparison was most unfair. The hydraulic crane was not a 3-ton crane at all, but a 5-ton crane, and if it were used in lifting loads far below its proper capacity, the results would necessarily be uneconomical.

Another speaker said that there was nothing which an electrical crane would do which an hydraulic crane would not do. Practically, it was found that the speed of lifting and lowering was limited, owing to the sudden jar which was set up by stopping and starting quickly. He considered it a great pity that such figures as Prof. Jamieson had brought forward should be put before the meeting as comparative.

Mr. Stothert pointed out that in discharging cargo by cranes the average load would be much less than the maximum; therefore, as the loads decreased, the efficiency of the electric crane would be greater than that of the hydraulic crane. As to the speed of running, there seemed to be a good deal of misconception. It was not a question of motive power, as whether the motive power was electrical or not was not the ruling factor. The great thing which a crane-maker should aim at was economy, and if one power were more economical than another, manufacturers would be glad to use it. The speed of discharging cargo depended largely on the stevedores and the men stowing the materials. With 250 feet lifting speed and 400 feet revolving speed, 70 cycles per hour can be reached, if the men were of sufficient strength to deal with that speed. In regard to the rate of travel of overhead cranes, he would point out that English shops differed from those of America, inas much as they were generally short and congested. He quite failed to understand the figures given by Mr. Matthews, which seemed to vary in the most unaccountable manner.

Mr. Head, in reply to the discussion, said that the efficiencies quoted by Mr. Matthews seemed somewhat irregular, and it was difficult to obtain anything instructive from them. The efficiency of 66⅔ quoted in the paper had been much commented upon, but he wished to point out that it was distinctly stated in the paper that this was the mechanical efficiency, and did not include the electrical losses in the motor. With regard to Mr. Ellington's criticism that sufficient had not been said about the commercial value of high speeds, he would have been glad to deal with this subject if space had allowed, but he had already largely exceeded the allotted limit of 1,000 words. The commercial value of speed was difficult to estimate, because it varied so widely under different conditions that no definite value could be given. For instance, in unloading a ship the vaule of speed would be high, whereas in the operation of putting a piece of work into a lathe, the value of speed would be very low.

With regard to Prof. Jamieson's figures, they indicate that as loads were reduced from those at which the hydraulic crane was designed to work, the efficiency fell off, whereas with electric cranes the efficiency and cost per unit was practically constant. This indicated that electric cranes had much greater elasticity than hydraulic cranes, and this was a strong argument in favor of electric driving.

A patent covering a process of making nickel iron alloys directly from the ores has been granted Noak V. Hybinette, of Bayonne, N. J., assignor to the International Nickel Co. The process of producing nickel steel from ores composed mainly of sulphides of iron, nickel and copper, consists in roasting the ore with salt, heating the material to decompose the chlorides of iron and nickel, leaching out the chloride of copper and then reducing the residue directly into nickel steel.

The Lorain Steel Co. has begun the building of its new ore docks at Lorain, O. The B. & O. R. R. will also expend a large amount of money in improving its facilities for handling ore and coal at Lorain.

Lake Superior Mining Institute.

After our report of the ninth annual meeting of the Lake Superior Mining Institute closed last week, the members and visitors left Ishpeming Wednesday morning, Aug. 19, to visit Pioneer furnace No. 2 of the Cleveland-Cliffs Iron Co. at Marquette. This plant interested all deeply, not only on account of those features of the equipment which are common to other modern furnace plants, but also on account of the arrangements for the utilization of every product arising from the manufacture of charcoal. The complicated process of making wood alcohol, the principal by-product, is carried on extensively. The immense charcoal kilns themselves are built according to latest designs, and so located as to save labor to the greatest extent. This furnace has been in operation since July, 1903.

After leaving the furnace, the special train was boarded, and the next stop was made at Munising, where the afternoon was spent in pleasure seeking. Nearly all went for a ride on the bay in launches, visiting Grand Island and other places of interest. This island, which contains about 12,000 acres, is now owned by the Cleveland-Cliffs Iron Co. Hunters will not be allowed upon the property and the preservation of such wild animals and birds as are desired for permanent inhabitants will be the policy of the company, while the enemies of such animals and birds will be exterminated. Pheasant raising has been begun, and this year a large number were hatched and are now protected in wire enclosures. The ruins of the furnace at the site of the old town of Munising were visited en route to the falls, which are an attractive feature. The town which once existed around the old plant passed into decay with the abandonment of the stack, but since the new Munising has sprung into existence, some of the old houses near the furnace site have been rebuilt and are now occupied, while the brick school, substantially built about 30 years ago, has again opened its doors to the village youth.

New Munising consists now of the tannery, the new pulp works of the Cleveland-Cliffs Iron Co., the new court house, the hotel on the beach, and a few business houses and dwellings. Its life is due almost solely to the activity of the Cleveland-Cliffs Co., and its future depends to a large extent upon the policy of that company, which can be relied upon to be progressive. The place is becoming more popular as a resort, and a more healthful, restful place to sojourn could not be imagined.

Business Session.

The final business session was held at the court house at Munising, Wednesday evening, when the following papers were read: "Iron Ore Deposits of Arctic Lapland," Chase Osborn, Sault Ste. Marie, Mich.; "A New Changing House at the Cliffs Shaft Mine, Ishpeming," John S. Mennie, Ishpeming; "The Champion Mill Intake Tunnel," F. W. O'Neil, Painsdale, Mich. Ninety-two candidates were elected to membership, showing the growing popularity of the institute.

The following new officers were elected: President, George H. Abeel, Ironwood; vice presidents, John H. McLean, J. B. Cooper; managers, John McDowell, W. J. Richards; treasurer, E. W. Hopkins; secretary, A. J. Yungbluth.

Numerous resolutions of thanks, especially to the railroads for courtesies extended, were adopted, and the meeting adjourned.

The special train left Munising at 11:30 Wednesday night, arriving at the Soo early next morning. The day was spent visiting the plants of the Consolidated Lake Superior Co., and the members then separated, many returning to Ishpeming and some going in other directions homeward bound.

Joseph A. Holmes, chief of the department of mines and metallurgy of the World's Fair, St. Louis, was in attendance, as were also the members of the Michigan World's Fair Commission, as follows: Frederick B. Smith, president, Detroit; Roy S. Barnhart, treasurer, Grand Rapids; Hal H. Smith, secretary, Ionia; Wm. A. Hurst, assistant secretary, Detroit; Dr. A. R. Ingram, Fenton; Chas. P. Downey, Lansing; Austin Farrell, Marquette. The commission desires that the exhibit of iron industries shall be large and creditable, and its attendance at the meeting was for the purpose of arousing interest among the members.

Members and Guests.

Among those in attendance were the following: W. T. Cole, Ishpeming; Samuel Redfern, Negaunee; H. H. Stoeck, editor *Mines and Minerals*, Scranton, Pa.; George L. Fairbank, Cleveland; Alfred C. Lane, State geologist of Michigan, Lansing; F. W. Sperr, Michigan College of Mines, Houghton; H. R. Harris, Marquette; M. M. Duncan, Ishpeming; E. E. Brewster, Iron Mountain, Mich.; J. H. Karkeet, Iron Mountain; Gustaf A. Hellberg, Norway, Mich.; O. C. Davidson, Iron Mountain; R. E. Mace, Duluth; H. D. Fisher, Florence, Wis.; Chase S. Osborn, Sault Ste. Marie, Mich.; John C. Greenway, Ishpeming; J. Parke Channing, New York; T. F. Cole, Duluth; W. H. Johnston, Isnpeming; Graham Pope, Houghton; Nelson P. Hulst, Duluth; W. M. Jeffery, Duluth; Harry Soady, Iron Mountain; E. D. Brigham, general freight agent C. & N. W. Ry., Chicago; W. J. Richards, Crystal Falls; J. H. Malloy, Ishpeming; H. A. Barr, Escanaba; G. F. Knapp, Oglebay, Norton & Co., Cleveland; Wm. G. Mather, Cleveland; J. H. Wade, Cleveland; R. H. Aishton, Chicago; George A. Newett, *Iron Ore*, Ishpeming; G. W. Youngs, Iron River, Mich.; J. D. Campbell, Chicago; George Smart, *The Iron Trade Review*, Cleveland; B. E. La Londe, Hibbing; H. B. Sturtevant, Duluth; J. S. Wall, Iron River; A. L. Flewelling, Crystal Falls; George J. Maas, Negaunee; Arvid Bjork, Crystal Falls; E. W. Hopkins, Commonwealth, Wis.; Chas. E. Lawrence, Amasa, Mich.; A. Lustfield, Crystal Falls; S. H. Vaughan, Milwaukee; W. E. Tyler, Chicago; W. H. Jobe, Stambaugh, Mich.; E. H. Cutter, Abbottsford, Wis.; Judge N. W. Haire, Ironwood; J. R. Thompson, Ironwood; H. E. Ellard, Ironwood; George H. Abeel, Ironwood; John H. McLean, Ironwood; H. G. Moore, J. M. Goldsworthy, F. L. Coventry, C. T. Hampton and E. E. Brewster, of Iron Mountain; C. C. Abbott, Ely, Minn.; John M. Bush, Ironwood; John E. McIntyre, Wakefield, Mich.; L. L. Newton, Mountain Iron, Minn.; W. A. Garner, Michigamme, Mich.; I. W. Truettner, Bessemer, Mich.; E. S. Roberts, Iron River; F. H. Armstrong, Republic, Mich.; Ed. Niness, Ironwood; J. M. Sherrerd, High Bridge, New Jersey; Floyd L. Burr, Vulcan, Mich.; F. W. Nichols, Houghton, Mich.; John Champion, Loretto, Mich.; E. D. Fitzpatrick, Marinette, Wis.; M. A. Hauschild, Florence, Wis.; A. P. Meads, Marquette; Michael Lambrix, Hurley, Wis.; J. F. Kern, Marquette; Kirby Thomas, Superior, Wis.

President Fitch's Remarks.

In our last issue brief reference was made to the opening address of Walter Fitch, president of the institute, at the session at Ishpeming. He paid a high compliment to the efficient work of Secretary Yungbluth, and spoke of the large membership built up in recent years. To the changes that have come in the mining region as the result of consolidated control, the speaker referred as follows:

"The growth of the institute has been very marked, but only in keeping with the growth of the industries it represents. During its life of nine years it has seen a revolution in these industries. Remarkable economies have been inaugurated in mining methods, so that while volumes of production of both iron and copper have increased, lower costs have been reached than ever before anticipated; this even in properties where conditions have become less favorable, such for instance as in the increased depth of the workings.

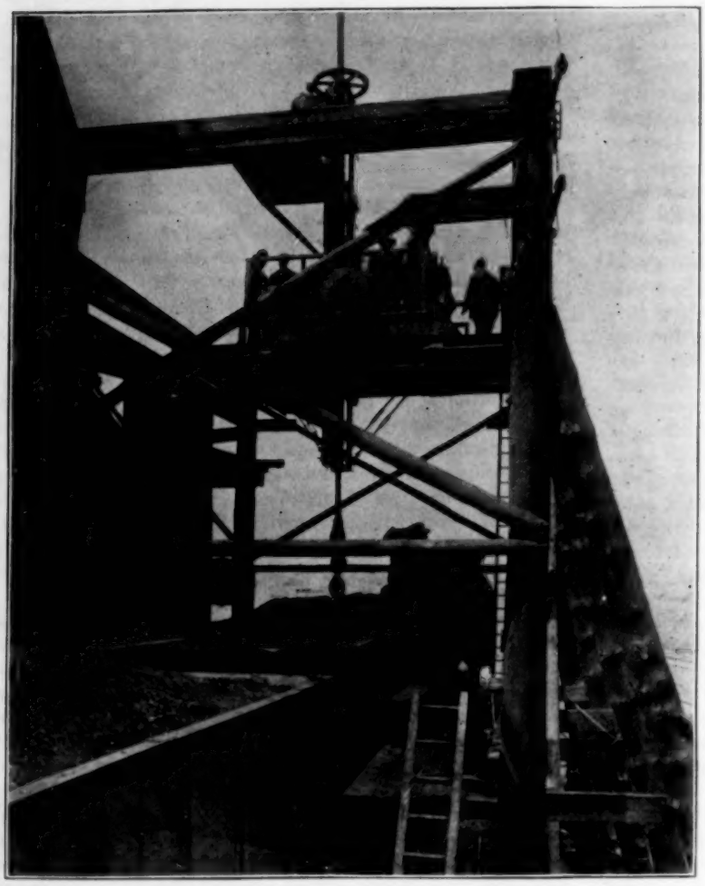
"A greater revolution than this has been brought about by the consolidation of many properties by large interests and one in particular. This revolution has, it would seem, brought many benefits which have been evident to all and in one respect has brought advantages which may become more evident in the future than have been so far apparent. I refer to the steadier operation of the mines in the iron districts and to the probability also of steadier and more uniform regulation of the wage rate for the employes. With the sharp reactions, that have previously occurred in this class of mining, these reactions in many cases, in the absence of powerful controlling interests as now exist, reached unreasonable limits and brought about unreasonably low values compelling sharp curtailments, the overstocking of the labor market, and the natural reductions in value of this commodity, in other words lower wages. I do not mean to anticipate in the future the entire absence of fluctuations, but I do anticipate that the extremes which have been experienced in the past will not be repeated. I believe we all

realize that such a change will result in a uniform benefit to all and to the industries, and be thoroughly welcomed by both the mine owners and to the employes. The claim made for the United States that it is a country of the lowest costs of production and the highest wages is becoming more true in each succeeding year.

"The Lake Superior mining district demands the highest expertness of labor and is willing to pay well for it. Decrease in wages never brings proportionate decrease in costs, because such decrease, unless it is universal, drives away to other districts the most intelligent labor and such as is independent. This is the class that is of course the most desirable, and all employers need the best. We can, therefore, all welcome the incoming of the larger corporations for the benefits thus promised and the members of this Institute and their friends and fellow employes in the mines can see in the future better conditions governing their work."

The Greenway Unloading Machine.

The ore unloading machine invented by John C. Greenway, superintendent of the mines of the Oliver Iron Mining Co. on the Marquette range, was inspected in operation at Section 16 mine. Its object is to break up frozen ore, so as to permit of readily unloading it into upper lake dock pockets after cold weather has set in late in the shipping season. Though called an ore unloading machine, it is designed rather to facilitate the operations of the usual unloading appliances.



THE GREENWAY UNLOADING MACHINE.

The machine consists of a traveling bridge, either spanning the full width of the dock, or, in order to operate either side of the dock independently of the other, spanning only half of the dock, the bridge truss being of a sufficient height to clear the stack of any locomotive or car operating on tracks beneath. This bridge travels at all speeds up to a maximum of 600 feet a minute. The wheels operating the bridge travel on rails laid parallel to the railroad tracks.

Operating on this bridge is a truck or trolley which carries the device for unloading the ore. This movement is transversely across the dock or at right angles to the bridging movement. Both are operated independently or together at the will of the operator through individual controllers of the Dinkey type regulating series wound motors. Upon the trolley traveling between two 16-foot solid cast iron guides, is a massive crosshead 10 feet in length. This crosshead carries, in brass bushings through its center, a 4-inch solid cold rolled round steel shaft with two steel forged collars set-screwed to the shaft immediately above and below to take up the upward and downward thrust when resistance is met in the ore.

This shaft carries the operating tool or bit at its lower extremity, being counter-bored at this point and slotted for dowel pins. Any form of bit may be inserted into this socket, to suit the particular needs of ore to be unloaded, the most common form being that of a huge auger 9 feet in length and 12 inches in diameter. Bolted to the crosshead in three sections is a rack. A pinion meshing in said rack, properly geared to a series wound motor, gives the crosshead, and consequently the shaft, and upward and downward motion, varying from a slow, almost imperceptible feed to that of a sharp impact or blow. At the top of the shaft is a 10-foot keyway and embracing the shaft at the uppermost end of the guides is a cast steel cut gear with feather in hub. This is operated from pinion of vertical motor attached in the proper manner and gives a turning motion to the shaft at the will of the operator entirely independent of the position of the crosshead. All gears are of cut steel, and in the entire construction, strength and reliability have been sought in every detail.

While there was no frozen ore available for the test of the machine before the members of the institute, some sticky hematite was in readiness. On this a new form of bit was used. It was round, with holes at intervals, into which horizontal steel bars about 12 inches long were driven, projecting in staggered form. Several forms of tools were shown, for boring and shaking up the ore, the selection depending upon the character of the ore and the extent to which it is frozen.

Changing House at Cliffs Shaft Mine.

John S. Mennie of Ishpeming, at the final meeting held at Munsing, read a paper on "A New Changing House at the Cliffs Shaft Mine," which was built to take the place of the house destroyed Dec. 1, 1901, by fire. The building as erected is 30 feet 4 inches by 135 feet 4 inches in outside dimensions and 11 feet from the top of the floor to the underside of trusses. The foundation walls up to the floor line are built of common rubble stone, laid up in cement. The exterior walls above the floor line are of common brick laid up in lime mortar, and are 10 inches in thickness, consisting of the two 4-inch courses of brick with a 2-inch air space to prevent sweating of walls. The two courses of brick are tied together every fifth course with clipped headers. Where the trusses rest on the walls piers are formed by building an extra course of brick on the outside. Three division walls run across the building, they are solid, 8 inches thick and are carried up to the roof boards as fire walls.

The floors throughout are of concrete and all are graded to the center of the rooms where connection is made through gratings to a 6-inch tile sewer pipe. These pipes are then carried under the floor to the outside of the foundation walls and empty into a box drain. The floor under the shower baths is graded to the wall to a drain of sewer pipe split in halves and these are connected to the main drain. There are ten shower baths, and the building is admirably arranged for the convenience of the men. The entire cost was $6,604.

Card System for Mine Supply Accounts.

A paper on "A Card System for Mine Supply Accounts" was prepared by F. W. Denton, of the Atlantic mine, but he was called home and it was not read. It was as follows:

Since the first of the present year a card system has been in use at the Baltic copper mine in connection with the "general supply account. Two sets of cards are employed. One set is retained in the supply clerk's office and is kept up to date by him, and the other set is kept in the main office and is written up by the office clerks.

The cards are 3 by 5 inches and 5 by 8 inches respectively, and are ruled as shown in the cuts. The difference between the two sets is as follows: On the supply clerk's card, Fig. I,

only the date, balance on hand, quantity received and quantity used are recorded, while on the office card, Fig. II, all of these appear, and in addition the initials of the firm supplying the goods, cost, value of amounts consumed and the accounts to which the supplies are charged.

The method of using the cards is as follows: When the duplicate bills for supplies are received, one copy is sent to the supply clerk, who checks the bill and enters the quantities on his cards. As supplies are issued during the month, a memorandum is made in an ordinary book in the usual manner. At

ARTICLE 1½-In. Black Pipe. 1903.

DATE	BAL.	REC'D	USED	DATE	BAL.	REC'D	USED	DATE	BAL.	REC'D	USED
1-1	Ft. 1006		655								
2-1	411										
2-9		500									
2-21		1045⅛	613⅛								
3-1	1352		830								
4-1	522		430								
5-1	92										
4-24		2000	220								
6-1	1962										

(Figures in italics represent red ink figures in the pen copy.)

THE IRON TRADE REVIEW

FIG. I.—SUPPLY CLERK'S CARD.

the end of the month the supply clerk prepares from his memorandum book two reports, one of whicch is arranged according to the expense accounts and the other according to the kind of supplies. That is, on one report under each expense account will be put all of the supplies charged against that account for the month, and on the other report under the name and size of each article, will be given the total consumption of that article. This last mentioned special report assists the office force in writing up the office cards. These reports are turned over to the general office. At the end of each month when two reports, the office force takes the reports of the supply clerk and completes the entries on the office cards. The special report of the supply clerk, showing the total amount issued of each kind of supplies, is used to check the work of picking out the individual records from the detailed report arranged by accounts, and insures all entries being made on each card at the same time. When the entries are finished on a card, and before returning the card to the drawer, the respective quantities used during the month are multiplied by the average price and the amounts entered in the proper column on the card, and also in the proper place in the supply clerk's report. The balances of quantity and value are then brought down on the card, and the work on that card is finished.

By copying the total value of supplies consumed from the cards to the supply clerk's special report and afterward checking the footing of this report with that of the detailed report, a good check on all the clerical work but the multiplication is obtained, and the average price checks that near enough. The values having been obtained in this way for the supply clerk's report, the main function of the card ceases as far as the mine books are concerned, and the supply clerk's report is then used in the usual manner. If any allowance is to be made for freight and other expense connected with supplies not covered by the original supply bills, such allowance can be made by adding a certain percentage to the footings on the supply clerk's report.

At the Baltic, the "supply account" on the ledger will in future be charged with the amounts of the supply bills only, and credited with the amounts as figured from the cards. The cost of handling supplies to and from warehouses, the cost of heating and lighting these buildings, and any other expense connected with the caring for supplies are all charged off each month as they occur to one of the general expense accounts under the name of "caring for supplies." The freight bills paid each month for supplies are charged off the same month to the various expense accounts in proportion to the values of the supplies used by these accounts.

This method of handling freight and other expense connected

ARTICLE 1½-In. Black Pipe. 1903.

DATE	BAL.	REC'D	FROM	COST	USED	VALUE	ACCT.	DATE	BAL.	REC'D	FROM	COST	USED	VALUE	ACCT.
1-1	Ft. 1006	@	10c	106 60	510	51	M. E.								
					60	6	C.&D.								
					35	3 50	H.								
					50	5 00	Const.								
					655	*65 50*									
2-1	*411*			*41 10*	505	47 98	M. E.								
2-9		500	I.E.S.	48 10	108	10 26	C.&D.								
2-21		1045⅛		98 79											
					613⅛	*58 24*									
3-1	*1352*	@	*9.5c*	*129 75*	570	54 72	M. E.								
					200	24 96	Cons.								
					830	*79 68*									
4-1	*522*	@	*9.6c*	*50 07*	92	8 83	M. E.								
					70	6 72	C.&D.								
					208	25 09	Con.								
					430	*41 24*									
5-1	*92*			*8 83*	60	4 80	H. E.								
4-24		2000	P.L.Hd.	165 96	100	12 80	S. R.								
					220	*17 60*									
6-1	*1962*	@	*8c*	*157 19*											

(Figures in italics represent red ink figures in the pen copy.)

THE IRON TRADE REVIEW

FIG. 2.—OFFICE CARD.

all of the supply bills have been received and checked, the office clerks enter the quantities and costs on the proper cards and compute a new average price if necessary. This average price may be computed as closely as desired. In the case of common iron, for instance, if the average price is 2.36 cents per pound, then a price of 2.4 cents may be used to simplify the work until the price falls to 2.3 cents or is raised by purchases above 2.4 cents.

As soon as the pay roll is finished at the first of the following month, before which time the supply clerk will have sent in his with supplies is as fair as any other in general use and has the following advantages: First, the balance shown by the "supply account" on the ledger should check with the balance shown by the cards; second, by keeping the expense of caring for supplies by itself this expense stands forth conspicuously each month and can be looked after the same as any other operating expense.

The time required to write up the cards is not as much as one might suppose. At the Baltic 48 air drills are in operation and about 750 men are employed. On June 1, there were in use 871

cards of each kind, and the value of the supplies on hand shown by the cards was about $28,000.00, which does not include fuel. The monthly consumption of supplies covered by the card is about $8,500.00.

With this amount of business our office force consists of a chief clerk, one assistant, one timekeeper and one supply clerk. It takes the clerk and his assistant about one and one-half days to write up the cards after the supply clerk's reports are received. As previously stated, the data taken from bills are copied on the cards at the end of the month when the office work is lightest.

What are the advantages of the card system? Under our old method the "supply account" was charged with all expense connected with the supplies and then ten percent was added to a price list to insure a balance on the safe side of the account. The list of prices could not be kept correct, because prices change, and the average price of the stock on hand was not known, therefore the prices were seldom right, and the ten percent addition to this approximate price only served to insure charging off enough.

When the time came for taking an inventory, these prices would be put on the list turned in to the office, and if the total value was sufficient to balance the account, everything was considered satisfactory. Generally there was a surplus, but just where it came in was not known. If there was a deficit, another round of warehouses and surface would be made and each trip would result in finding something that had been omitted from the original inventory. These finds might balance the account. If they did not, then the deficit would be charged off and another year started without knowing just where the deficit occurred. Under the card system the balance that should be on hand is shown on the first of each month, and this can readily be checked, in most cases by inspection, if desired. In any event, the cards check the consumption, because, when a requisition is put in for more of a given article, the cards should show the stock of that particular article to be used up or nearly so.

By entering the exact bill cost on the office cards and computing the average price each month if necessary, the supplies are charged off at exactly the proper price.

With certain supplies which are bought in bulk and issued in small quantities that are not accurately measured, such as waste, oil, etc., the quantity reported as consumed can be increased and the price kept the same and chances of a deficit avoided. By charging only the bill cost to the "supply account," the balance as shown by the cards should check with the balance shown by the "supply account." When the inventory is taken it is only necessary to determine whether the balances called for by the cards are on hand. If there is any deficit or surplus it is known just where it occurs and the trouble can be located at once and a remedy applied. By this method the exact cost per ton for supplies is known from month to month, and the average for the year should not be affected by any surplus or deficit.

In addition to these advantages there are other important ones, especially at those mines where the purchasing is done at the mines, as in the case of the Baltic. It can readily be seen that from time to time as supplies are purchased it is easy to run over the cards and make up an order covering a sufficient quantity of supplies to offer an inducement to dealers to figure close. Also, when an agent calls and says he has a specially good bargain to offer, it is possible to turn to the cards and see just what quantity of that particular material was on hand the first of the month, and its average cost. Then, too, by studying the consumption of supplies as shown by the cards, it is often possible to simplify the stock carried, getting rid of some sizes or adopting certain standards.

At a meeting last week of the Zanesville, O., bondholders of the Eastern Tube Co., of that place, it was decided to act as a unit in all further proceedings connected with the present receivership. A resolution was adopted requesting the trustees of the mortgage on the plant, the North American Trust Co., of New York, to take such steps as may be necessary to bring about a prompt foreclosure.

The stove foundry of the Taunton Iron Works, Taunton, N. J., has been sold and the new purchasers have decided to reopen the plant at an early date.

Evolution of the Rolling Mill.

WITH DESCRIPTION OF THE MERCHANT STEEL DEPARTMENT OF THE MINNEQUA WORKS.

In the last issue of *Camp and Plant*, published by the sociological department of the Colorado Fuel & Iron Co., T. J. Brown, superintendent of the merchant steel department of the Minnequa works of the company at Pueblo, Col., presents an elaborate article describing this portion of the extensive new plant that has been under erection at Pueblo in the past two years. The article is not only interesting for its details of construction, but for its sketch of the evolution in the rolling of merchant steel in the United States. We make the following extracts:

When Bessemer stetel was first introduced in this country in 1867 the steel ingots were drawn into blooms under steel hammers. A little later the Cambria Iron Co., of Johnstown, Pa., had rolls prepared and placed them in one set of the twenty-one-inch mill rail train housings, where steel ingots eight and one-quarter inches square were reduced to blooms six and one-half inches square. These blooms were then charged in the furnaces, reheated and rolled into rails. This practice was successful, and I believe was the first blooming mill used in this country.

First Three-High Blooming Mill in America.

In January, 1871, the Troy Steel Co. started a thirty-inch three-high blooming mill, provided on both sides of the rolls with lifting tables containing loose or idle rollers and raised by hydraulic pressure. The rolls were designed to reduce a twelve-inch square ingot, which was of the proper weight to make two thirty-foot rails. These ingots, after being deposited on the rollers of the front table, were pushed into the rolls on both sides by hand and turned by tongs. It required eight men to perform this operation. This train had the top and bottom rolls stationary. The middle roll was moved up and down by four screws run through the bolsters carrying its necks. These screws were rotated by a friction clutch, which was driven by a belt off the main shaft of the engine driving the train, and was controlled by a hand lever at the end of the rolls. There were four grooves in each roll, and by the travel of the middle roll the possible reductions were increased. The mill worked successfully and proved a great improvement over the steam hammer for reducing steel ingots to blooms.

About six months later the Cambria Steel Co. put in operation a mill designed by George Fritz. This mill differed from the Troy mill in having its middle roll stationary, while the top and bottom rolls were movable. The important feature, however, was the tables. These were raised and lowered together by hydraulic power, and the rollers were arranged to be driven from the main engine by friction clutches. This mill was also equipped with a manipulator, which consisted of a small car beneath the table, with prongs on top of it. These prongs extended through the table rollers when the table was down. The car was moved transversely to any desired position under the table by a hydraulic cylinder, and by lowering the table the ingot caught upon the prongs and was turned, or by pushing the prongs against the side of the ingot it could be moved from one groove to another. This mill was a great success.

Modern Three-High Blooming Mill.

About 1880 what is known as the modern three-high blooming mill was introduced. Since that time no appreciable change has taken place. In these mills, which were made heavier in every detail, and the diameter of the rolls increased to between thirty-five and forty inches, the rolls were stationary. The tables are raised and lowered by a horizontal hydraulic cylinder connected with cranks and rods. The table rollers are driven by an independent reversing engine through gears carried by a toggle. At the present time the writer knows of but four of these mills in use in this country, three of which are used for producing rails exclusively, and the fourth is a mill having two trains for further reducing the blooms to four-inch, small billets and angle splice bars.

First Two-High Reversing Blooming Mill.

The first to undertake the task of constructing a two-high reversing blooming mill was John Ramsbottom of Crewe, England. This mill was, in its general features, so nearly like the later blooming mills that one wonders how he happened to miss

it. This mill, like the modern two-high reversing mill, was driven by a cylinder engine, which was reversed by the ordinary locomotive links, but instead of the hand lever for reversing a steam or hydraulic cylinder was employed. The sudden stopping or reversing of the rolls was effected by admitting steam or water pressure to the small cylinder which reverses the links. This, operating the main steam valves of the engine cylinders, admits steam in front of the pistons, causing the engine at the will of the operator, either to stop or move in a reverse direction.

When the works of the Freedom Iron & Steel Co., near Lewistown, Pennsylvania, were built in 1868, a plate mill had been imported from England, with a Ramsbottom reversing engine, said to be "the best of its class yet produced." This was soon changed to a rail mill, which was abandoned after having been in operation about one year. It was this mill and engine, with blooming rolls, substituted for the original plate rolls, which the Cambria Iron Company utilized in 1878 to work the then large eighteen-inch ingots. It was therefore an English mill, but the tables which constituted its chief title to distinction were American, having been designed by a former superintendent of the Minnequa Works, the late D. A. Jones. These tables consisted of large rectangular frames, carrying loose or idle rollers, the bodies of which rested on solid tracks. The frames with the rollers were moved to and from the rolls by hydraulic cylinders. With this arrangement it will be seen that when the table with the ingot resting on the rollers was moved the ingot traveled twice as fast as the table. With this table was combined a manipulator, consisting of two hydraulic cylinders, one on each side of the table, with the piston-rods extending over it and carrying a head so shaped that by forcing them against the ingot it could be moved from one place to another.

First Two-High Reversing Blooming Mill in the United States.

The first two-high reversing blooming mill in this country was built and installed by the Cleveland Rolling Mill Co. in 1872. It reversed with a three-gear friction clutch. Later this was changed to the five-gear system, this being the method generally employed in England at this time for reversing two-high mills. With one exception this was the only mill built in this country to use anything but the reversing engine to drive a two-high reversing blooming mill in connection with their open-hearth plant, which was the first to be built except at a Bessemer plant, and also the first two-high reversing blooming mill to furnish a four-inch billet.

With the two-high mill it is a story of progressive development for nearly twenty years. The earlier mills were driven by engines with gearing of three or four to one, the engine running at a greater speed than the rolls. These ratios have been cut down until the gearing has been abolished, and the latest mills are coupled direct to the crank shaft. The table frames, formerly made of "I" beams, have been displaced by heavy cast-iron frames, securely bolted together. The cast-iron rollers with wrought-iron shafts cast in have been replaced by steel rollers, with the bearings cast on. The driving of the table rollers, begun by taking power from the main engine, was soon changed to the use of a separate engine driving both tables together through a countershaft, and finally the countershaft has been done away with, and an engine coupled directly to the line shaft is used for each table. At the same time there has been a steady improvement in the table gearing. In the earlier mills the table rollers were divided into groups driven by spur and idle gears. The number of these gears has been gradually reduced until each roller is now driven by a mitre gear, and there is not a single intermediate gear or countershaft of any kind in the best mills, an engine being coupled directly to the table side shaft.

Rolling of Bars Between Grooved Rolls.

The grooved rolls used in the rolling of bars were invented by Cort, an Englishman, in 1783. That rolls without grooves for making flat bars or plates were not invented by Cort at the same time, as has frequently been stated, but were a prior invention, is shown by a passage in Boswell's Life of Johnson. In the diary of his Welsh tour, Aug. 3, 1774, when at Holywell, Johnson says: "At a copper works which receives its pigs of copper, I think, from Warrington, we saw a plate of copper put hot between steel rollers and spread thin. I know not whether the upper roller was set to a certain distance, as I suppose, or acted only by its own weight. At an iron works I saw round bars formed by a notched hammer and an anvil."

Early Mills Without Guides.

In the earlier mills the round and square bars were made in what is known as hand rolls; that is the bars were entered in the roll grooves without the aid of guides, and were held from turning by a man holding them with a pair of tongs and putting the bars through the finishing groove three or four times, turning it one-quarter way round each time it was entered into the groove. This system of rolling limited the length of the bar to about sixteen feet.

The introduction of oval and diamond-shaped grooves, to prepare the bar for the finishing groove, and of guides made to conform to the shape of the bar as it entered the finishing groove, has made possible the rolling of bars 400 feet long.

Among the first improvements on the original Cort mill was the introduction of three high rolls for the rolling of small sizes. This mill consisted of four stands of rolls. The first set, being known as roughing rolls, was designed to take the pile or billet and reduce it to the size necessary to make the section being finished at that time. The second set of rolls was known as strand rolls, and the rolls were designed with oval and square passes. The ovals were introduced for the purpose of reducing the section faster than could be done with square grooves. The rate of reduction, using both square and oval grooves, was about 26 percent. When all square passes were used, the reduction was not to exceed about 20 per cent. The third and fourth sets were made shorter and were used for finishing rounds, squares and hoops or bands. The bars were passed back and forth, first between the bottom and middle rolls and then between the middle and top, thus shortening the time consumed in working a given number of passes about one-half, since on the two-high mill the bar was worked in one direction only, and was pulled back over the top roll and again centered between the rolls.

This mill was next improved on by the addition of a separate and larger set of roughing rolls, usually placed about thirty feet from the other part of the mill, the engine being coupled direct to the roughing mill, and driving the smaller train by means of a belt. This increased the production of the mill very materially and permitted the use of a larger iron pile, or steel billet. These old mills were characterized by their limited room, and only short bars, twenty to eighty feet long, were rolled. These short lengths were run out on the floor, to be dragged, after cooling, to the shears by muscular force.

The oldest type of heating furnace was hand-fired, and charging, drawing and transferring of the piles to the rolls by hand required a great deal of skilled labor. Many of these furnaces are still in use, but their number is steadily decreasing. They are considered a very good type of furnace for intermittent running on small jobbing mills with frequent stops for roll changing, especially where the coal prices are low and the labor cheap. These furnaces are superseded by the Siemens regenerating gas furnace, in which manufactured gas is the fuel used. In mills producing iron, however, the old method of handling material have been adhered to.

Modern Merchant Steel Mills.

There are two systems in use for the production of steel bars, one of which uses a four-inch billet, the other using billets from one and one-half to four inches square.

In the former case the four-inch billets are cut to length to suit the size of the bars being rolled, and are heated in a furnace of the continuous type. The earliest continuous furnaces were designed and built by Gustav Ekman, the eminent Swedish metallurgist, prior to 1848. About thirty-two years later William Allen of England added to the Ekman furnace a mechanical billet charger and water pipe skids for supporting the billets, thus eliminating much of the severe labor incident to to the earlier type of furnaces. Later there was added to this furnace the gravity end discharge, by which the billets were deposited on a line of driven rollers which conveyed the billet to the roughing rolls. These furnaces are now so arranged that either a double or a single row of billets may be handled in the furnace. In the latter case it is possible to handle a four-inch billet nine feet long and weighing 475 pounds for the rolling of the large sizes of round or flat bars. The roughing

mill consists of four or more sets of rolls (depending on the minimum size to be finished), placed one ahead of the other, the rolls running with increased speed in reversed ratio to the area of the pass. While there are a number of grooves in each set of rolls, to suit the various sections which the mill is designed to roll, only one pass is made in each set. About fifty feet from the roughing mill other rolls, either continuous or looping, are placed, the arrangement depending upon the range of sizes to be rolled. Fifty feet from this second mill is located the finishing train, which usually contains five or six sets of rolls, in which the bars are finished by hand, using one pass in each set.

The second system starts in with a smaller billet, thirty feet long, which is located in a continuous furnace with a suspended roof and having a chamber about thirty-two feet long and sixteen feet wide. Into this furnace the billets are charged one by one, by means of a pair of feed rollers, the upper roll being driven and the lower one idle. The lower one, however, can be advanced to or withdrawn from the upper one by means of a steam cylinder. A billet is charged by placing the end between the rolls and pressing up with the lower roll, which causes the upper and driven roller to engage with the billet and run it into the furnace. The hearth of the furnace is placed on an angle of about forty-five degrees, and as the billets reach the bottom of the incline they are fed to the rolls by a similar arrangement to that for charging.

The first set of rolls of the four or five stand continuous mill is located very close to the furnace, a large portion of the billet being reduced to the finished size before the last end of the same billet has left the furnace. Six looping stands of rolls placed in groups of two, and each successive group driven at a faster speed, finish these bars in 400-foot lengths. These long bars are taken care of as they emerge from the finishing rolls by a conveyor, running slightly faster than the finishing rolls. Since each bar finished follows the preceding bar in rapid succession, the first bar must be taken out of the way of the next bar. This is done by conical rollers which constitute the conveyor. By throwing these rollers on an angle the bar is thrown toward the cooling bed, the last end being thrown over by a lever. The bars are then removed to an inclined cooling bed, where it is kept straight by resting in the angle formed by the sloping supports of the bed on one side and a series of removable fingers on the other. When the succeeding bar is ready to go on the cooling bed, the fingers are temporarily removed, and the first bar slides about four inches down the incline, where it is arrested by another series of fingers, thus leaving its former position ready for the next bar. These fingers are all connected, and constitute a systematic escapement, operated by a steam cylinder and controlled by a boy. This means the cooling bars move down the incline at regular intervals, but are at all times kept straight. Upon reaching the foot of the incline the cooled bars are grouped on a narrow, level bed, where the groups of ten to twenty bars are transferred to the shear table by means of pushers placed at regular intervals and operated by a steam or hydraulic cylinder. These groups of bars are carried on the shear table rollers to a quick-acting vertical shear, the stroke of which is controlled by a clutch, stopping after each cut. After cutting to the required length the bars are bundled, loaded direct into cars for shipment in case of large orders or loaded on small trucks to be held to make up orders as required.

Merchant Steel Department of the Minnequa Works.

Having outlined the history of the manufacture of merchant steel in the United States, and described in general the processes employed in a modern merchant steel mill we shall now consider the merchant steel department of the Minnequa works of the Colorado Fuel & Iron Co., at Pueblo, Col. These, with the open-hearth department, make up what are commonly known as the "new east mills" at the steel plant.

The stripper building contains one double hydraulic stripper, provided with four hydraulic car-movers. The ingots, as they stand on the cars on which they have been cast, are conveyed to the heating furnaces. The furnaces are in a building 222 feet long and 62½ feet wide, with a lean-to 22 feet 7½ inches, extending the whole length of the building. There are five furnaces, each with four pits for four 18 by 20-inch ingots. The furnaces are commanded by two automatic Morgan electric charging cranes, having a capacity of five tons.

The same ingot crane takes the ingots from the heating furnaces to an electric ingot car, which takes them to the approach table at the blooming mill.

The 40-inch two-high reversing mill is installed in a building 300 by 54 feet. The engine house is 90 by 46 feet.

The mill is driven by a direct-connected 55 by 60-inch McIntosh-Hemphill double-reversing engine. The mill tables are each driven by a 12 by 14-inch Crane engine, connected to the driving shaft of the table. A novel arrangement is provided for changing rolls. In line with the center of the train is a car bearing a track, upon which is a second car or buggy, which can be slid through the roll housing to rest upon projections on the inner side of the further housing. The roll is let down upon the truck or buggy and can then be withdrawn by means of the fifty-ton electric crane, which commands the whole building.

The top roll is counterbalanced by hydraulic cylinders placed on the top of the housings. These cylinders are also used for lifting the rolls when changing, and can be supplied from the regular pressure system, or from an independent accumulator, in which case the water is forced into the accumulator when the top roll is forced down by the screws, and the accumulator forces the water into the cylinders to raise the roll when the screws are run to the top to allow the top roll to rise. Ninety feet from the rolls is placed a 450-ton shear, which is used to cut the long billet in two, or cut off bad ends when necessary. Eighty-nine feet two inches from this shear is a power shear, driven by an upright engine. The latter shear is provided with a tilting table, which allows the scrap to fall below the shear to a scrap conveyor. This conveyor deposits the crop ends, or scrap, in open-hearth charging boxes outside the mill building.

Adjoining the shear tilting table is what is known as a skew table, in which the rollers are placed at a slight angle, for the purpose of assembling all the billets on the same side of the table. On one side of the table is a side guard. The other side of the table is left open or free from guards, in order to allow the billets to be removed from the rollers into a cradle by means of an electric pusher mounted on a track running parallel with the table. The cradles containing billets are handled by three overhead electric traveling cranes, each having a span of about sixty feet. These cranes run at right angles to the table and command the billet storage yard, which is 190 by 340 feet. In this yard the billets for the various steel merchant mills, or rod mills, are stored. At the south end of the billet yard, and adjoining the table referred to, is a roller billet conveyor, extending to the twin cotton tie mill furnace, which supplies the rod and merchant steel mills with hot billets. These roller conveyors are built in sections, each section being driven by an electric motor. Forty men are now employed about the 40-inch blooming mill proper, which does not include those working about gas producers and boilers.

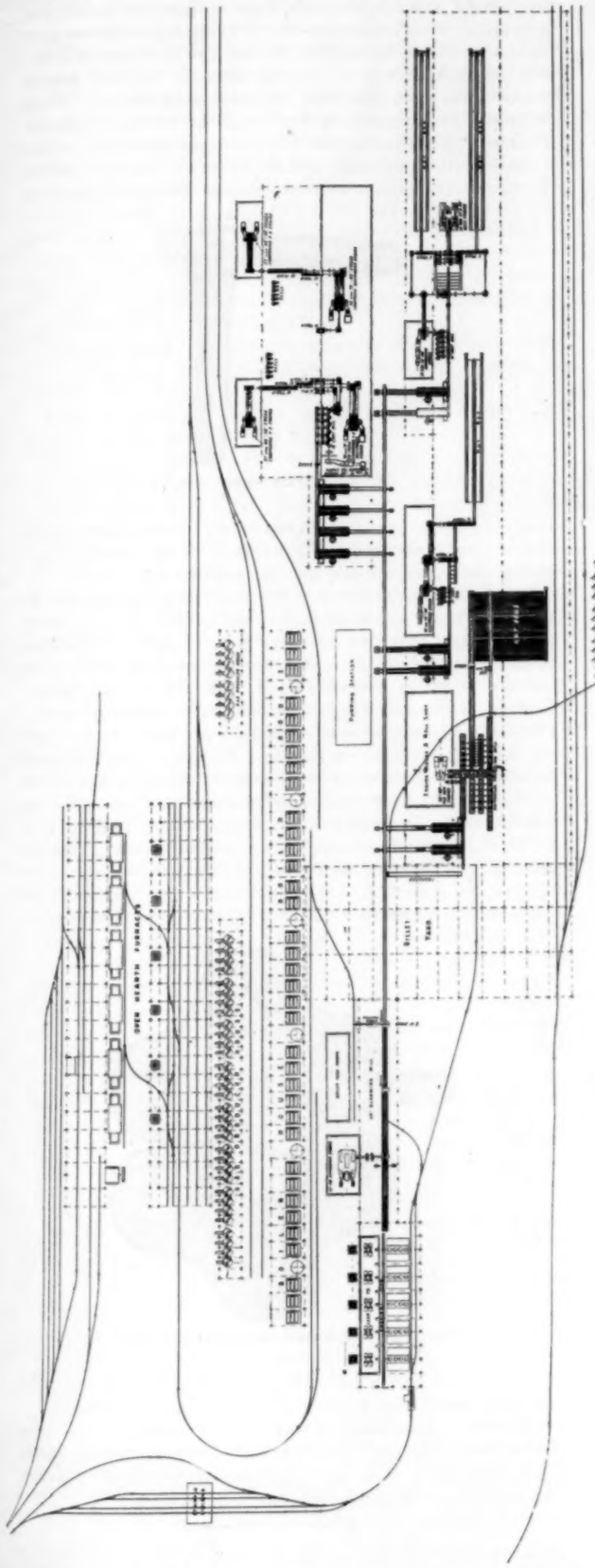
Twenty-Four-Inch Merchant Steel Mill.

The main building of the merchant steel department is 70 feet wide at this point. The first mill to the south of the blooming mill is a 24-inch two-high reversing mill. This mill is driven by a 36-inch by 48-inch double-reversing engine. The mill consists of four stands of rolls. The first stand is provided with a set of vertical rolls on the furnace side of the train, making this stand of rolls practically a universal mill. The top rolls of the first and second stands are counterbalanced by hydraulic cylinders, placed underneath the housings. Each stand is also equipped with a hydraulic screwdown, similar to the blooming mill. These two stands will be used mainly for the rolling of tin and sheet bars, and all sizes of flat bars from six inches up to eighteen inches in width. The first and second stands of rolls will also be used for roughing down or reducing blooms to proper sizes for the smaller sections that are finished on the fourth stand, and for rolling the larger sizes of beams and channels.

All product finished on the second stand of rolls will be conveyed by roller tables to a pair of hydraulic shears, located about 150 feet from the rolls, where, after having been cut to proper lengths, it will be conveyed by driven rollers to the cooling beds. From this point the bars may be loaded into cars or placed in stock by means of electric traveling cranes.

The third and fourth stands of the train are of the or-

dinary two-high type, and will be used for finishing the larger sizes of round and square bars, light sections of rails, from 25 to 50 pounds per yard, angle splice bars, and all sections of structural steel—beams, channels, angles, "T" and "Z" bars. All material finished in the fourth stand will be conveyed by



GENERAL PLAN OF NEW EAST MILLS, MINNEQUA WORKS OF THE COLORADO FUEL & IRON CO., PUEBLO, COL.

driven rollers to a hot saw, located 150 feet from the rolls, where, after being cut to lengths, it will be transferred to the cooling beds before mentioned.

The mill tables are all driven by small double-reversing engines, while the shear and hot saw tables will be driven by electric motors. The engine house is 160 feet by 66 feet, which allows ample space for storing extra roll housings. It is intended to put the rolls and rests complete in these housings, and change housings and rolls together, thus making it possible to change rolls very rapidly. For a mill which must keep a large variety of sections, often in small quantities, all delays in changing rolls seriously reduce the effective working time during which the mill should be earning money.

The mill is commanded by a 50-ton electric traveling crane, while the engine room is supplied with a 20-ton crane. Two continuous heating furnaces, with automatic gravity and discharge will reheat the blooms for this mill. These furnaces, as are all the furnaces in this department, are arranged so that the blooms and billets are pushed from the conveyor onto skids or slides by hydraulic power and fed into the furnace by an electric motor. As a hot bloom is fed out of one end of the furnace a cold bloom is fed into the furnace at the other end, thus making the operation continuous.

Provision has also been made for transferring the hot blooms from the conveyor directly to the mill without reheating. The three cooling beds, each 30 feet wide by 100 feet long, and running at right angles to the main building, will deliver the finished bars under a crane outside this building. From here the bars may be loaded on cars or put in stock to be shipped as orders are received.

To the west of the main building and running its entire length will be a warehouse, 96 by 1,200 feet, equipped with a 10-ton electric traveling crane, shearing and straightening machines, and such other machinery as may be found necessary.

The capacity of this 24-inch mill will be 250 tons every 24 hours.

Twelve-Inch Merchant Steel Mill.

This mill is in three sections, the first consisting of four continuous stands of rolls, 14 inches in diameter and 30 inches long. This train will reduce a 4-inch billet to 1¾ inches square, or to two inches to three inches by two inches, and a 5-inch billet to 2¼ inches square. The second section, which is 40 feet from the last stand of the continuous mill, consists of two stands of 14-inch rolls, the first of which is three-high. When rolling the smaller sizes of bars a repeater will be used between the two stands, while on the larger sizes a transfer between the first and second trains will convy the bar to the second set of rolls, thus skipping the first set. The third section, which is located fifty feet from the second train, consists of five looping stands for finishing rounds from 5/8-inch to 2 inches, squares from 5/16-inch to 1½ inches, flat bars 1½ inches to 4 inches wide, angles up to 3 inches, and mine rails from 8 to 20 pounds to the yard.

The second and third stands of this train are three-high, and when necessary extra passes may be worked at this point. A 36-inch and 66 by 48-inch tandem, compound engine is coupled directly to the 14-inch train, the second and third trains being driven by a rope drive from the same engine. Two heating furnaces of the continuous type, and capable of handling 4-inch and 5-inch billets nine feet long, will supply the mill with hot billets. The method of handling billets is the same as that used at the 24-inch mill. The main building which covers this mill is 96 feet wide. The engine house is 180 feet long and 40 feet wide. A 15-ton overhead electric traveling crane commands this mill for the changing of rolls and handling machinery. Thirty feet from the finishing train is an automatic cooling bed, 200 feet long by 20 feet wide, at the end of which is a pair of shears for cutting the finished bars to length. After leaving the shears the finished bars are either loaded into cars or stored in the warehouse. The capacity of the 12-inch mill will be 200 tons every 24 hours.

Twin Hoop or Cotton-Tie Mill.

This is a double finishing mill, served by one roughing train. The first section consists of six continuous stands of 14-inch

rolls. The second section, consisting of two continuous stands of 12-inch rolls, completes the roughing portion of the mill. Between these two trains is located a hydraulic shear for cutting the billet, as it leaves the first train, into two or more pieces, it being the intention to roll a billet on each mill alternately. From this point the mill is double, and the bars are transferred to the third section of the mill, which consists of four continuous stands of rolls, the first three stands being 10 inches and the fourth 9 inches in diameter. The fourth section contains four looping stands of 9-inch rolls, the second and third stands being three high. The bar is worked back and forth through these looping stands, once through each set of rolls, except on shaped section or large sizes of hoops, when it may be necessary to work twice through each set of three-high rolls.

A 30-inch and 54-inch by 48-inch tandem compound engine drives the 14-inch continuous mill through bevel gears, and the two stands of 12-inch rolls by means of a rope drive. The finishing stands of each mill may also be driven from this engine. A 30-inch and 54-inch by 60-inch cross-compound engine will drive the two-10-inch continuous and two looping trains by means of belts. These engines are both located in the main building, which at this point is 126 feet wide. Thirty feet from each finishing train is located an automatic cooling bed, 250 feet long and twenty feet wide, at the end of which are two vertical shears for each cooling bed, for cutting the finished product to lengths. A 15-ton electric traveling crane serves a portion of the mill for changing rolls and handling the machinery, while a 20-ton electric traveling crane covers the balance of the mill. The 4-inch billets for this mill are heated by a furnace of the same type as those used on the other mills, space being reserved for the second furnace should it be necessary.

The capacity of the twin hoop or cotton tie mill will be 200 tons each 24 hours.

This building is 95 feet long and 46 feet 3 inches wide, and contains 36 boilers of 500 horsepower each, making a total of 18,000 horsepower. The pressure carried on these boilers is 125 pounds. The boilers are of the Stirling water tube type and are installed one boiler in each battery, thus making them easy of access for repairs. There are six draft stacks, each 200 feet high and 10½ feet in diameter. The bases of these stacks are twenty feet in diameter. Six boilers are connected to each stack, and a fan for each six boilers supplies forced draft. Coal is distributed to the boilers by means of a steel trestle between the gas producers and boiler house. An overhead traveling electric crane, running the whole length of these buildings, handles the ashes by means of a clamshell bucket. Four compound feed water pumps, three of which are 14-inch by 24-inch, and 13-inch by 24-inch, and the fourth 12-inch by 18-inch and 9-inch by 18-inch, supply water to the boilers. These pumps are in a separate building, 120 feet by 32 feet, just south of the blooming mill engine house. Water pressure, 500 pounds to the square inch, for operating hydraulic machinery, is supplied by two Wilson-Snyder pressure pumps, 22-inch by 36-inch by 9½-inch by 36-inch.

Eight Duff water-sealed gas producers furnish the gas for heating the pit furnaces at the blooming mill. These producers are in the same building as the open hearth gas producers. Nine of the same size gas producers furnish the gas for heating the furnaces for the merchant steel mills, and are located just west of the warehouse.

When all of the mills described above are completed some 500 men will be employed in the merchant steel department.

July 1, 1903, the 40-inch blooming mill was put in operation. The material for the buildings for the other mills is being delivered rapidly, and they will be erected as fast as possible. Most of the machinery is already on the ground, and will be set up as soon as the cranes in the several buildings are installed.

In connection with the article on Longstreth's metallic packings which appeared in *The Iron Trade Review*, coming from the Journal of the American Society of Naval Engineers, credit for the cuts should have been given the *Engineering News* from which they were reproduced.

The annual convention of the National Founders' Association will be held in Washington, D. C., Nov. 11 and 12, 1903.

THE CRESCENT FLASK PIN.

Among the annoyances incident to the foundry business, there is perhaps none more common and more aggravating than the trouble from flask pins. It is well known by all foundrymen that the common kind of pins are continually breaking, or coming loose, as a result of the strain thrown upon them while "shaking out," or by careless handling by workmen. A flask-pin out of repair produces a "shifted" casting, besides takes extra time and attention of the molder. These difficulties are overcome by the use of the Crescent flask pin, which has just been patented. The pin has at the upper end and forming part of the handle a cam. When the handle is rotated the cam works against a projection and forces the pin down

FIG. 1.—A NEW FLASK PIN.

into place. The cam is cut away on the side so that the pin may be readily removed. Fig. 1 illustrates the pin and Fig. 2 shows the socket, eye and pin in combination.

It will be readily seen that this is a self-locking detachable pin, and that it is therefore not necessary to have as many pins as flasks, but only as many pairs of pins as there are molders, one pair of pins answering for an entire floor. The use of the pin is simplicity itself. The socket and eye are fastened to the flask (iron or wood) in the ordinary manner; then when the molder starts the mold, he drops the pins into the sockets and gives the handle a half turn, which securely locks the pin in place—the tapering portion of the pin seating itself firmly into the taper-hole of the socket casting. The mold is then completed in the ordinary manner, and as soon as the flask is finally closed, the pins are withdrawn, by giving the handle a half turn backwards, and then the same pins are used on the next flask, and so on continuously throughout the whole floor. Experience has shown that it is not necessary to

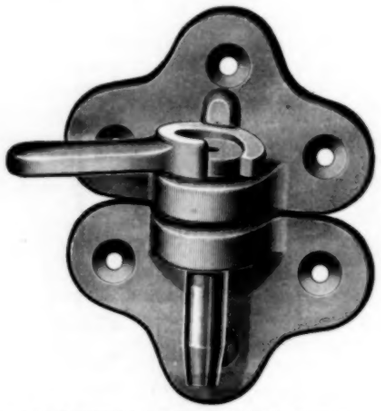


FIG. 2.—FLASK PIN, EYE AND SOCKET.

clamp a flask before removing the pins and, if desired, the clamping may be left over till the entire floor is completed.

The No. 1 pins are 9-16 inch diameter, and 3 inches long under head. The No. 2 are 11-16 inch diameter, and 3½ inches long under head. The device is manufactured by the Crescent Machine Co., of Leetonia, O.

Upon the application of the majority of the stockholders of the Heating, Ventilating & Foundry Co., of Wheeling, W. Va., Judge J. C. Hervey decided to appoint a receiver for the plant. The company operates a foundry at Elm Grove, near Wheeling. The company was promoted by O. L. Badger, formerly of Pittsburg.

PERSONAL.

H. L. Gantt of Schenectady, N. Y., a contributor to *The Iron Trade Review* and an expert in economical shop management, has completed his engagement as modernizing engineer with the American Locomotive Co. He has had the satisfaction of receiving a cordial endorsement from the foremen of the Schenectady Works which in part reads as follows: "We wish to express our appreciation of yourself and your principles of shop management, believing fully that these methods as outlined by you and put into practice here are bound to succeed wherever they are introduced and properly carried out. It has been our experience so far that your system points out at once the origination of all delays, so that the same may be properly looked after, and also places the responsibility for such delays where it should justly rest, thereby promoting a harmony and good will among employers and employes heretofore unattainable." Mr. Gantt has decided not to connect himself in the future with a single company, but will take up the practice of a consulting engineer.

John Stevenson, Jr., formerly president of the Sharon Steel Co., who has been touring Europe for several months, is en route homeward.

Edgar S. Cook, president of the Warwick Iron & Steel Co., Pottstown, Pa., has sailed for Europe.

Dr. Joseph Struthers has resigned as associate editor of *The Engineering and Mining Journal*, of New York, to become assistant to Dr. R. W. Raymond, secretary of the American Institute of Mining Engineers.

J. S. Jeans, secretary of the British Iron Trade Association, is in Canada as a delegate from the association to the Congress of the Chambers of Commerce of the British Empire. Mr. Jeans expects to visit the United States this fall before returning to England.

President-Director James Ross of the Dominion Steel Co., Sydney, N. S., has resigned and has announced his complete withdrawal from the affairs of the company. In his letter he states that it would be impossible for him to act as president of the Dominion Steel and Dominion Coal companies under present conditions. A permanent successor has not yet been elected, but J. H. Plummer will act as president temporarily.

John F. Taylor, treasurer and vice president of the Republic Iron & Steel Co., was in Youngstown, O., last week to witness the first cast from the new converters installed in the Bessemer plant.

A number of changes have been made in the heads of departments of the Homestead works of the Carnegie Steel Co., owing to the election of W. E. Corey as president of the United States Steel Corporation, and the election of Alva C. Dinkey as his successor as president of the company. Harry J. Davis, master mechanic of the Homestead plant, has been elected assistant to superintendent Azor R. Hunt. J. M. Horton was appointed master mechanic. Richard Moon was appointed assistant master mechanic. William Graham was appointed private secretary to Mr. Hunt, succeeding G. E. Preston, who becomes private secretary to President Dinkey. William Sullivan, of the office force at Homestead, has been added to the office force of the president of the United States Steel Corporation in New York.

Charles James, general manager of the Norway Iron & Steel Co., York, Pa., has resigned to become manager of the American Car Foundry Co. at Berwick, Pa.

E. T. Hendee, of New York, has been appointed advertising manager for Joseph T. Ryerson & Son, Chicago, to succeed Morris W. Lee.

At the last meeting of the directors and stockholders of the Composite Metal Co., of Catasauqua, Pa., L. P. Clark, manager of the Allentown Hardware Mfg. Co., of Allentown, Pa., was elected general manager.

The contract has been placed for a new foundry building for the Composite Metal Co., of Catasauqua, Pa., at $10,860.00. The company expects to have the building ready in six weeks.

Charles M. Schwab is reported, in conjunction with C. H. Matthiesen, to be in control of the Chicago Pneumatic Tool Co. The announcement is made this week but it is understood that the transaction took place some time ago when the holdings of Max Pam were bought.

M. A. Neeland, general manager of the Wm. Tod Co., Youngstown, O., sailed for a European trip on Aug. 22 and will be absent two months.

Frank McDonald has been appointed superintendent of the Bessemer plant of the Republic Iron & Steel Co. at Youngstown, O., to succeed P. D. Mackey, who recently resigned to go with the United States Steel Corporation at Wheeling.

THE FUTURE OF THE STEAM ENGINE.

The five years' extension of his patent of April 23, 1884, granted to the Hon. C. A. Parsons has now expired, though in view of the originality of his invention and its probable commercial importance in the future, few, we think, would maintain that the patentee has been able to reap an adequate reward for knowledge and skill, notwithstanding the extended life of his patent. Fortunately, in this instance the inventor had capital at his command, as a poorer man would probably have ruined himself in the struggle to overcome the—at that time—well founded prejudices of engineers against any departure from the well type of reciprocating steam engine.

Lord Kelvin has described the invention of the Parsons turbine as the greatest advance made in steam engine practice since the time of James Watt; and it is of interest to note that just as Watt was fully abreast of the science of heat, as understood in his day, so the creator of the compound steam turbine was also well equipped with theoretical knowledge, having been twelfth wrangler in 1876, and in addition to this, like James Watt again, was also a very capable mechanic. Indeed, the advance made required constructive ability of a high order, combined with a competent knowledge of the properties of steam and the theory of the ordinary water turbine. The multiple-expansion reciprocating engine, the other great discovery in steam engine practice made last century, belongs, on the other hand, to a different class of improvement, the invention being in the nature of a lucky accident, since the inventor introduced the system solely to meet certain mechanical considerations, and without any expectation of economizing steam. In was the fact that for many years no rational explanation of the economy of the compound engine was possible, which made so many makers of high-class Corliss engines slow to introduce the principle into their own practice. This explanation was finally arrived at by the detailed study of the indicator diagram, rendered possible by Regnault's experiments. This study showed that at the point of cut-off the steam present in the cylinder was often not more than 50 percent of the total feed. When the significance of this fact was grasped, high-class engine builders commenced to compound their engines, with the result that the steam consumption of these was reduced from over 18 pounds per indicated horse power per hour to well under 12 pounds. Engineers are sometimes, in regarding the magnitude of their own achievements, tempted to ignore the help they have received from the physicist; but though it is quite true that the results of the indicator analysis above mentioned are now applied daily by many quite incapable of making it themselves, their debt to Regnault remains, just as that of the draughtsman who uses a table of circle areas does to the dead-and-gone mathematicians who first succeeded in approximating to the value of π

As matters stand, the master feature of the Parsons turbine is now open to the whole British manufacturing world, and incidentally is likely to afford it an excellent object lesson in the practical value of some acquaintance with elementary thermodynamics. Many excellent engine builders, having by a system of trial and error succeeded in building capital steam engines of the ordinary type, will now find their accumulated experience valueless to them if they enter the new field; and lacking the guidance of the theta phi diagram, or its equivalent, may find themselves like mariners afloat on a strange sea without sextant or compass. That they must sooner or later adventure the voyage seems very probable, unless they content themselves with building the smaller class of prime mover for which the turbine seems less well adapted than for larger units. The makers of large reciprocating engines will, it is true, have another course open to them, in that they can take up the manufacture of internal combustion engines, which promise to be in the future the principal competitor of the steam turbine in the economical production of power on a large scale. The change, however, from the manufacture of high class steam engines to the building of large gas engines will also involve the "scrapping" of much valuable experience.

Nevertheless, where an adequate fall of water is unavailable the large power stations of the future will, it would seem, be almost certainly equipped with either steam turbines or gas engines. The latter have, of course, certain advantages from a thermodynamic point of view, but require a large staff to look

after them. It is true that of late years some remarkable results have been obtained with the ordinary type of steam engine operated with superheated steam, but these are in no way better than similar results obtained with large turbines, as may be shown by the fact that Messrs. Brown, Boveri & Co., in the case of a 10,000 horse power turbine, now on order for Frankfort, have guaranteed a steam consumption of 15.4 lb. per kilowatt hour, which is claimed to be equivalent to 8.8 lb. per indicated horse power hour. One objection may properly be taken to many recent statements as to steam consumption, which are often impossible to compare one with the other with absolute fairness, since this steam consumption is reckoned at boiler pressure instead of being reduced to "from and at 212 deg." It is thus not easy to make a really accurate comparison between engines using steam under different conditions. The engine taking steam at the higher pressure gains an advantage over and above that legitimately due to its greater temperature range. As matters stand, however, the pressures used in turbine plants are practically the same as in the case of modern reciprocating engines, being fixed by the type of boiler used. Dr. de Laval, it is true, has driven his turbines with steam generated at pressures of 1,600 lbs. per sq. in. or more—a feat which it would not be easy to parallel with a reciprocating steam engine; though it must be borne in mind that somewhat similar pressures are reached in the Diesel oil engine, which is of the reciprocating type.

Whilst, however, the reciprocating engine can apparently compete with the turbine in the matter of steam economy, in every other respect the advantage seems to rest with the newer motor. The Turbinia gave one a striking object lesson in this regard. With an ordinary type of torpedo boat destroyer running at high speed, the whole floor of the engine soon becomes flooded with oil; which cerainly constitutes an excellent example of the truth of Palmerston's definition of dirt as matter in the wrong place. With turbine machinery there is no difficulty in keeping the engine room clean; and the staff there has certainly its labors much reduced. In spite of the 8,000 h. p. on board the Queen, there is nothing whatever to see in the engine room. The lubrication is automatic, and the greaser, of such importance on board sister vessels of the same service, has little or nothing to do. Even in the less strenuous conditions of central station practice, the saving in oil as compared with a reciprocating engine is equivalent to a saving of at least 1 lb. of steam per indicated horse power hour, whilst at the same time the staff may be reduced by a half, if not more. With these advantages it is certain that large engine making firms will, as suggested above, be compelled in self-defense to make up the manufacture of this class of prime mover. Already several firms have done so. In this issue we give an account of two turbine steamers which are being built by Messrs. Vickers Sons & Maxim, and by Messrs. William Denny & Brothers, for the Midland Railway. The British Westinghouse Co. is preparing to build large turbines for electric stations, and also Messrs. Willans and Robinson, Ltd., while two firms at least on the northeast coast are entering into the manufacture of steam turbines. By the aid of these firms and others it is probable that a number of valuable improvements of a minor character may be effected.

An interesting modification of the Parsons turbine is now being put on the market by the General Electric Company of America. In the Parsons turbine the pressure varies continuously as the steam passes through successive series of blades. The type may therefore be considered to be a compound "pressure" turbine. It is, however, quite possible to apply the compounding principle to an impulse turbine of the Girard type, or, as we are speaking of steam, we should perhaps say of the de Laval type. This idea seems to have originated with Mr. Ferranti, whose patent is numbered No. 2565, of 1895. The same idea, probably quite independently, was taken up by Mr. C. G. Curtis, of New York, whose earliest English patent is dated September 1, 1896. There is, however, a long road to be traveled before a good patentable idea is satisfactorily converted into solid metal, and so far as we are aware, Mr. Ferranti never made the attempt, being probably too much occupied with other matters. Mr. Curtis was, however, more persistent, and succeeded in interesting the powerful General Electric Co., of Schenectady, who, after much experimenting, are now putting on the market compound impulse steam turbines of very large size, which it is claimed show a very high efficiency. One advantage of this type lies in the fact that it is unnecessary to admit steam over the whole circumference of the turbine. In fact, the Curtis steam turbines can be constructed as "partial-admission" turbines. The diameter of the rotor may therefore be comparatively large even for units of no great size, and the speed of rotation may be correspondingly reduced, with a pressure turbine, on the other hand, the size of the rotor is somewhat rigidly connected with the power to be exerted, as the steam must be admitted over the whole circumference of the wheel.

The governing of an impulse turbine is similarly a more simple matter than the corresponding problem in the case of a pressure turbine. It is merely necessary to reduce the arc of the rotor through which steam is admitted. In the original de Laval type several nozzles played on the same wheel, and as the load fell these were shut off one by one, reducing the expenditure of steam and the power delivered in a correspond ing degree. Quite a similar arrangement in principle, though differently worked out, has been adopted in the case of the Curtis turbine. The largest size for which designs have yet been got out is rated at 5,000 kilowatts. The speed in this case is 514 turns per minute, and it is claimed that the steam consumption on full load will not exceed 10¾ lb. of steam per kilowatt hour. The axis of these turbines is vertical. The load on the footstep is simply that due to the weight of the rotor, and this footstep is lubricated by oil supplied under a pressure of 250 lb. per square inch. In order to prevent damage in case of a failure of the oil supply, provision is made for automatically shutting off the steam should the pressure in the oil pipe fall below a certain limit.

It will be seen that the efficiency reached by this type is not yet as high as has been attained by Messrs. Brown, Boveri & Co., with large compound pressure turbines of the Parsons type. But the construction of compound impulse turbines is still in its infancy, and there is no reason to suppose that with greater experience better results will not be obtained; though even as matters stand, the steam consumption guaranteed by the General Electric Co. closely approaches the best figures given by engines of the ordinary type, being equivalent to little over 11 lb. per indicated horse power; and, taking in account the saving possible in lubrication and labor, these turbines probably make at least as good a showing from the commercial standpoint as that of the very best reciprocating engines, though we note that Mr. Charles T. Porter, to whom the practice of mechanical engineering is already so deeply indebted, is prepared to guarantee a consumption of under 9 lb. of steam per indicated horse power hour for engines built to his designs. His system comprises the use of steam at a pressure of 300 lb. per square inch, superheated by 200 deg. Fahr. or more. The designed speed is 600 revolutions per minute for a piston speed of 2,000 feet per minute. It should also be noted that Messrs. Eaton & Co., who are the British licensees for the Schmidt superheater, are also prepared to guarantee an exceptionally small steam consumption for their engines.

Coming back to the Curtis steam turbine, it is very improbable that the highest economy possible with these has yet been reached. In some respects the type has a mechanical advantage over the Parsons turbine, in that the clearance can be somewhat larger; but it must be admitted that hitherto no difficulty has yet arisen in the pressure turbines from the smallness of the clearance allowed.—[Engineering.

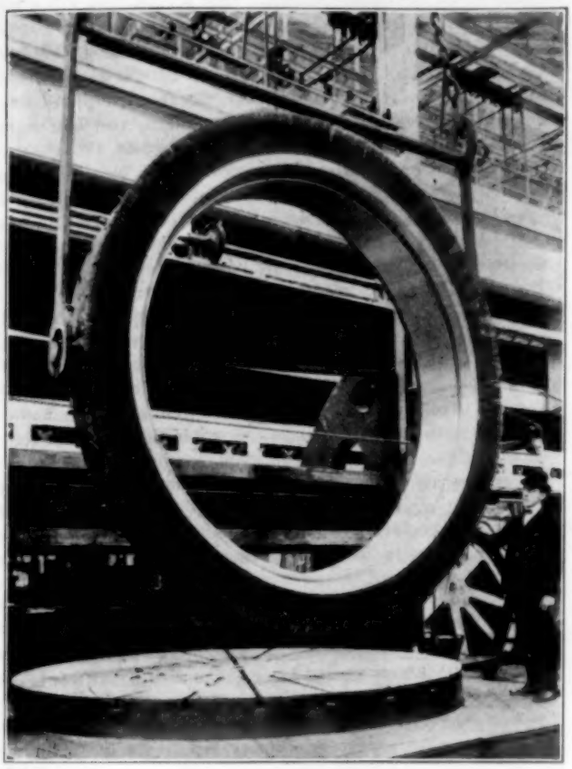
The Kentucky Gear & Machine Co. of Louisville, Ky., has been incorporated with $20,000 capital for the purpose of engaging in the manufacture of elevators and elevating machinery. The incorporators are Gottlieb Binder, A. A. Butterweck, G. E. Butterweck and J. A. Stege.

The new stack of the Alabama Consolidated Coal & Iron Co., Gadsden, Ala., was blown in on Saturday, Aug. 22. No. 2 stack of the Thomas plant of the Republic Iron & Steel Co., Thomas, Ala., also went into blast on the same day, having been out for nearly a month, undergoing extensive repairs.

The Northwest Foundry Co., of Chicago, has been incorporated with $30,000 capital for the purpose of manufacturing machinery and gray iron castings. Charles S. Kundson, W. F. Jarvis and J. Cratty are the incorporators.

A LARGE COMMUTATOR.

The halftone illustrates the assembly of a commutator which is to form part of an 1,800-k. w. direct current generator field under construction in the shops of the British Westinghouse Co. at Manchester. The generator is being supplied to the order of the City of London Electric Lighting Co. and will be run in connection with units of similar size already supplied by the company and working at the Bankside Station. The external diameter of the commutator is 10 feet, and there are 900 segments, each of hard drawn copper, around the circumference. The generator is designed for a normal output of 1,800 k. w. at 450 to 500 volts, and will be capable of supporting a continuous overload of 20 percent. The commutator serves to illustrate the class and size of work being turned out from the Westinghouse Works, now that the organization has become settled into definite operation. The development of this large undertaking will be watched with considerable interest during the next few years, especially as some of the largest schemes for power distribution and railway operation are passing through the company's hands.



A 10-FOOT COMMUTATOR.

German Technological Association

The annual convention of the German Technological Association, which comprises local organizations of engineers in a number of large centers in the United States was held in Pittsburg on Thursday, Friday and Saturday, Aug. 20, 21 and 22. About 150 members attended the convention, and much time was given up to visiting the many industrial plants in the Pittsburg district.

At the Thursday morning session C. Mercader of the Carnegie Steel Co. presented a paper on "Hollow Pressed Axles." Later in the day the plants of the Pressed Steel Car Co. and the Pennsylvania Malleable Co. were visited, and in the evening a banquet was given at the Monongahela House. On Friday the plants of the Carnegie Steel Co. at Homestead and Braddock and the Westinghouse plants at East Pittsburg were visited, and on Saturday the plants of the McKeesport Tin Plate Co. and Allegheny Plate Glass Co. The convention closed with a "Kommers" at the Monongahela House. The next convention will be held at Washington in August, 1904.

The plant of the Moline Plow Co., Moline, Ill., which has been idle for some time, is now in full operation.

PIECE WORK AND DAY LABOR.

The eleventh annual convention of the National Railroad Master Blacksmiths' Association was held at Buffalo, N. Y., on August 18-20. Among the papers of general interest was the following on the "Advantages of Piece Work Over Day Labor," presented by Thomas F. Keane of the Ramapo Iron Works, Hilburn, N. Y.:

In these times of close competition when labor-saving devices are daily being placed upon the market, the vital question concerning the life of a firm is the limit to which it can minimize its cost of production at an increase of its output. A concern which cannot rapidly and economically manufacture its wares might better "shut up shop" first than last at a reduction of losses to itself; and the inability to solve this very question has caused more failures and strikes than any other known factor.

In attempting to solve this question employers have equipped their shops with the best and latest inventions on the market, and have ultimately been disappointed in the results obtained. They have tried various premium schemes, and the most of these schemes have failed of their purpose; some because the employes, naturally suspicious and afraid their employers were trying to work them to their limit of endurance without appreciating their increased efforts and sufficiently rewarding them, refused to take hold from the start; others because at the end of the trial both parties were disappointed in that their expectations had been greater than realized. The employes, expecting the premium to be greater than it was, dropped back at the end of the trial into their accustomed "rut;" the employers, failing to see the output materialize to the proportions they had expected, had, on their part, "cut" the prices at the end of the trial.

Competition is the result of ambition, and there is more competition in the world to-day than there ever was before; and it is because this competition has been limited to representatives, and not created for individuals, because factories and industries have competed, but individual laborers have not been allowed to compete, that so much trouble concerning the labor question has been involved. For the employe is just as ambitious as his employer. His cry (the employe's) is "There is no equality," and he is correct. There is no equality; there never was and there never will be. No two human beings were ever created alike. But when the laborer is compelled to work for a specified amount per day, regardless as to whether or not he is more competent than his fellow; when he is not allowed to compete with his fellow-laborer for his day's wages, the incentive to utilize his best skill and ingenuity is removed, the limit of equality is augmented, and the worker, not in sympathy with his employer, works automatically, doing what he must, shirking when he can, continually thinking of the time when he can throw aside his tools and quit. He learns his trade up to a certain point, and beyond that point he never progresses; he never becomes more skillful and proficient than necessary; he never works more rapidly than he has to. But there is one course open which, if followed, will more surely reach this limit of equality than any other, and this same course will also provide the incentive and outlet for the laborer's ambition. This is the substitution of piece work for day labor; and this change will not only most surely reach the question of equality for the workmen, but it will aid the employer, *partly* through having created an incentive and outlet for the laborer's ambition; it will aid the employer, I say, in increasing his output at a reduction of cost.

Let us take up this question of the advantages of piece work over day labor, and follow it closely and critically. It can easily be divided into two parts. 1. The advantages gained by the laborer. 2. The advantages gained by the employer.

Careful consideration of the first part of the question clearly shows that in substituting piece work for day labor the workman is materially benefited in more ways than one. In the first place piece work creates the incentive for ambition; secondly, having created the incentive, it allows of the laborer obtaining his reward according to his own degree of skill, ingenuity and ambition. Look at the question from the day labor position. All in the same department receive the same wages at the end of the week, and yet some men will be far more competent than others. But will the competent man work any the harder when he knows the slowest and least skillful one in his department is getting as much as he does? Is that an

incentive to use the best efforts one is capable of using? Is that equality? By piece work all is changed. The price per piece is regulated by the number the average workman can turn out in a day. Under this system, then, the better man earns more than he was accustomed to. If, on the other hand, a man is not able to do the amount required, he will not make so much, to his employer's gain. He will receive, however, a *just* amount for *his* day's work. But besides creating an incentive for ambition, this substitution will create a competitive strife among the men, which will react for their own good. No man likes to be the poorest or slowest worker in his department, much less when it is a question of wages and ultimate discharge. Do you doubt for an instant that, if piece work is instituted, at the end of the first week every man in the shops will know who has earned the most and who the least? If you do, you are mistaken. And when it is known the better workmen will start in to eclipse one another in skill and rapidity, while the poorer ones, ashamed of their showing, angry at their "cut" in pay, will "take a brace" and work with the avowed intention of showing that they are just as good as the best man in the department. And what does this amount to? It amounts to this: that at the end of a short time all who are any good whatsoever will be earning more than they ever did while in their race for speed the men, bringing into play all their skill and ingenuity, will, instead of standing still, be learning the best and most efficient way of using their tools and machines. In other words, they will be making themselves more valuable and necessary to their employers, and in so doing increasing their own income.

But piece work solves another question for the mechanic. The competition evolved through piece work will soon have the men driving themselves as their employer was never able to drive them. While, as regards their holidays, piece work will give them more than they ever had before. For by piece work, a skillful mechanic will complete the amount of work deemed necessary for an average man's day long before the day is over, and then, unless there is a "rush" order in the shops, he can either continue his work, or quit, just as he pleases. If he quits, he has his extra time to devote to his family, his pleasures, or to rest. If, however, he continues to work, and that is probably what he will do, he can make no complaint upon the number of hours worked, because he himself preferred to work.

Through, then, the substitution of piece work for day labor, the limit of equality is most nearly reached, in that each man is paid according to his own deserts; and as a rule, each man earns more at a reduced number of hours than he did before. At the same time the slow and inefficient mechanic is learning to his own advantage to work rapidly and skillfully, both that he may increase his daily earnings, and that his pride may not suffer because of his sluggishness.

Let us now turn to the second part of the question, to the advantages gained by the employer; for it would indeed be an impracticable employer who instituted a wage system, or any other system, when the benefits were all gained by the employes. The employer, through this substitution of piece work for day labor, profits in two ways. He gains on the reduction of cost for productive labor, and on the reduction of cost for non-productive labor. Or he may prefer to say that he profits: 1st, on the immediate cost of production; 2nd, on the indirect cost of production.

Under the first year, profits on the immediate cost of production, there are two sub-divisions: (*a*) The profits on the cost of labor; (*b*) The profits on the cost of materlal.

Where piece work is substituted for day labor, although the mechanic may increase his wages, yet the employer diminishes his cost of production; for by piece work, capital pays for what is accomplished and not for lost time. The employer may lose a little on the few men who always apply their best energies and their closest attention to the work; but he saves on the mass, who, working automatically, plod on, day by day, while with each swing of the hammer, or each turn of the drill, they wonder how long they must still work before their day is finished. It is this lethargy on the part of the men, working by the day, which makes the cost of production so great. By piece work this lethargy disappears; there is not a moment of time wasted; for a minute saved is a minute gained, and every man, knowing that he may earn as little or as much as he chooses, turns in with a will. There is no waiting for helpers. If the helper is not around when needed, instead of waiting for him, the mechanic removes the piece himself. The men are no longer mere machines, they are dexterous, energetic human beings.

But perhaps some of you believe that through piece work a dishonest man has a chance to turn in, as completed, more work than he has actually done. This resolves itself down to a point of accurate inspection, and at no incurrence of extra expense to the employer. For where the inspector formerly noted the quality of the work, he will now note both quantity and quality.

But besides minimizing the cost of production on the waste of time, the employer saves on the cost of the material used in the output. All work is inspected before shipping, but if the labor is by the day, and a piece is condemned and rejected, the employer loses both the time and material. On the other hand, where the labor is by the piece, the workman who made the rejected article is not paid for it, at a saving to the employer of the cost of the labor. Admitted that even by day labor if a workman continually turns out imperfect products, he will be discharged. But by day labor it is often difficult to tell, especially where all the men are turning out the same article, just which ones are responsible for the rejected pieces. By piece work, however, it is known to a certainty just how many rejected pieces a workman is guilty of. Suppose, though, that a mechanic, manufacturing ten pieces a day; only turns out one imperfect article a week. True, that is not much of a loss; but if there are two hundred men, each turning in an imperfect article per week, the loss is considerable. And this substitution of piece work for day labor will eventually remedy this loss on wasted material through rejected pieces to a considerable extent. For a mechanic, knowing his labor will net him nothing if his work is condemned, sees to the fact that he makes as few mistakes as possible; is careful instead of careless; and where he formerly turned in one imperfect piece per week, he now turns in but the same amount of imperfect work in double, and often triple the length of time. Through piece work, then, the employer has diminished his expenses on the immediate cost of production, not only by minimizing the amount of material used, but also by paying for what is accomplished, and not for time wasted. And at the same time he has increased his output in so far as fewer defective pieces are turned in.

Under the second head, the increased profits on the indirect cost of production, there are four divisions:

(*a*) The profits saved on the amount of fuel used; (*b*) The profits saved on cost of labor for motive power; (*c*) The profits saved through minimizing shop room; (*d*) The profits saved on depreciation of machinery.

To-day the manufacturer's profits depend on the ability of the employer to increase the output without correspondingly increasing the cost of production. So far we have shown that capital saves, through the substitution of piece work for day labor, on the immediate cost of production; but we have also clearly demonstrated that capital also increased the output, and at no extra expense, in that fewer defective prices are turned in. But through this substitution the output is materially augmented in still another way, and this, too, without entailing extra expense. For by substituting piece work for day labor, the employer has created an incentive for the workmen, who, in order to double their own pay, double the output. And this output is doubled without increasing the non-productive expense. This will be seen in taking up the four divisions, *a*, *b*, *c*, and *d*, respectively.

It takes a certain amount of fuel to run a machine, whether that machine is used continuously or not. Also, it takes the same amount of fuel to keep a forge or a furnace continually burning. Therefore, if the men, for their own benefit, double the output, although it will necessitate continual use of both machines and forges, nevertheless it will not increase the amount of fuel used. And in producing the motive power to run the machinery it will also take the same number of men, whether the output is great or small. The output then is doubled, but it has entailed no extra expense.

Another great saving for the employer, where piece work is substituted, is that smaller buildings and less room are needed. By day labor, in order to double the output, it is axiomatic that either more machinery (and therefore more fuel), and more labor are necessary, or a night shift must be "put on."

The first plan, besides increasing the expense of the machinery, necessitates an extra expense for buildings. While if a night shift is "put on," although it curtails extra expense for machinery and buildings, nevertheless it will incur an extra expense, at a reduced amount of work per man; for twice the amount of fuel will be needed, while no man can turn out as much work at night as he can in the day. Yet the man working at night will receive the same wages as the man working by the day.

And last, but not least, the depreciation on machinery is not so great by piece work as by day labor. And this depreciation is one of the greatest expenses the manufacturer has to contend with. For by piece work a machine will turn out more during its life than by day labor. First, because, although a machine during its term of usefulness may be able to do only a specified amount of work, yet out of the work done, fewer pieces will be rejected, as the men are paid for that only which passes inspection. Another cause for less depreciation on the machinery is that the men who handle it are more skillful when the work is by the piece than when it is by the day. And while a machine operated by a skillful mechanic is seldom misused or broken, one handled by the ordinary laborer is continually in the repair shop; a constant source of expense for the employer. And the reason that the men who work by the piece are more capable than those who work by the day is twofold.

First, because by piece work a man's competence is accurately known from the beginning, and only those men are retained who show marked ability, as the output is sufficiently great that all ordinary labor can be dispensed with. Second, because, impelled by the competitive spirit originated through piece work, the men, in their race for quality as well as quantity, not only apply all the skill they are capable of, but, to improve their output, learn better and more efficient methods of handling their tools and machines, that they may work them, also, up to their capacity.

And in giving out piece work, one thing should be noticed and followed, as far as practicable. Always give the same kind of work to the same men, as men constantly doing the same piece will not only increase their speed, but, also, besides turning out work that passes inspection, turn out work that passes with a higher percentage of perfection; not a small point in a manufacturer's favor.

But, perhaps, some here, having heard this argument, plead in favor of the premium plan; for it is impossible for you to uphold the day labor question any longer. There is this against adopting that course. In the first place, in order to inaugurate such a system, two factors and much consistent work upon the part of the employer are necessitated. Besides, this system usually fails when put into effect in the shops.

The employer, in introducing this premium plan, has to increase his inspection force, and he has also to originate an entirely new department. The work of this department is not only to fix the amount of time in which the average man should finish his piece, but it has also to determine the ratio by which the machine is to be paid for the amount of time saved in completing his work. The inspection force, as already noted, will also have to be increased, as through the premium plan it is very easy for a man to increase his premium by making the time saved greater than it was. These factors, of course, increase the manufacturer's expenses.

But when the premium scheme is placed in the shops the real trouble begins. Workmen to-day are suspicious of their employers, and afraid that every change is going to be for the employer's benefit alone, at a loss to themselves. In inaugurating this scheme, before the department in charge of the premiums have obtained a correct knowledge as to the ratio upon which to base their payments on time saved, many errors will occur, and at each change in pay the men will become more suspicious. By the time, then, the premium *department* is on a firm footing, the men will have decided that, although they may be earning more money, they are doing more work than paid for by their premiums. The result will be that they either strike or fall back to their accustomed pace and wages. Besides, the premium scheme is usually put in a shop where the output is small, due to inefficient management. The men know when the management is poor, and as quickly as their employers, and knowing this fact, are afraid to risk anything by a change.

Take a case, however, when this premium plan has been adopted for trial with the consent of both parties. What has happened? In but one instance brought to my notice has the premium plan succeeded. This is in Mr. Rowan's works. He has through this system increased his output at a reduced cost, and also increased the pay of the men. But as this is one special case, it is only fair to infer that it has probably been not only because of Mr. Rowan's marvelous ability as a manager, but to his individual personality as a man, and the feeling of good fellowship which existed, as he himself stated, between him and his men at the time the scheme was adopted. And it is doubtful if there are many men possessing all these faculties necessary for the adoption of such a scheme.

In all other cases this plan has not attained its purpose. From the report of the "Board of Trade" in the United Kingdom, out of 178 firms who adopted this wage system, 94 totally discontinued it. While from the remainder all had either so modified it that it was no longer recognizable as a premium wage system, or were simply waiting until the end of the time agreed upon to discontinue it. As previously noted, this discontinuance was usually because of the disappointment of both parties in the realizing their expectations, but in other cases it was because of the failure of the concern to make money.

Where piece work, however, has been tried, at a fair wage per piece, to my knowledge, the scheme has never been discarded through failure of attaining results.

By this substitution, then, of piece work for day labor, the problem concerning a maximum output at a minimized cost, a problem which cannot be evaded, but must be solved, for it is upon this solution that a firm's future to-day hangs in the balance, this problem, through piece work is satisfactorily met. And not only met to the employer's benefit, but to the workman's gain; for through it he increases his skill, *and*, at a reduced number of hours, his wages.

German Pig Iron Production.

The production of pig iron in Germany for the half year ending June 30 is reported by the German Iron and Steel Union as follows in metric tons:

	First Half 1902.		First Half 1903.	
	Tons.	Percent.	Tons.	Percent.
Foundry iron	790,172	19.7	883,763	18.1
Forge iron	596,485	14.8	450,956	9.2
Steel pig			376,738	7.7
Bessemer pig	190,992	4.8	209,704	4.4
Thomas (basic) pig	2,436,127	60.7	2,961,110	60.6
Total	4,013,776	100	4,882,271	100

The total increase this year was 868,495 tons, or 21.6 percent. Steel pig, in the classification, includes spiegeleisen, ferromanganese, ferro-silicon and other alloys.

In the answer of the Susquehanna Iron & Steel Co., Columbia, Pa., to the bill of John Q. Denney's, the director who last week petitioned for a receivership, it is charged that statements in the plaintiff's bill are "false and untrue" and that they were "maliciously made by him to injure the defendant corporation." It is declared that the plaintiff's allegation, "that the total amount of cash on hand was $7,934" to pay accounts amounting to $277,064, is garbled and "intentionally misleading," inasmuch as the accounts receivable amounted to $186,294 on June 30, and the merchandise and quick assets to $427,850. It is stated that in addition to these things, which aggregated $621,078, the corporation owned a plant valued at $1,388,253. It is further stated "that at no time was a dividend omitted to be paid except in the last six months ending June 30, and this was due to strike conditions, the increased cost of fuel and depreciation in the value of manufactured materials. The corporation manufactured its products to fulfill contracts, which the other parties to said contracts refused to take, leaving the product on hand. The depreciation in values began after Jan. 1, 1903, and continued during the last half of the fiscal year."

The Racine Steel & Iron Mfg. Co., Racine, Wis., has increased its capital from $125,000 to $250,000.

SOME POINTS ON FORGINGS.

In an address before the Engineers' Society of Western Pennsylvania, James H. Baker, of Pittsburg, brought out the following interesting points concerning the production of forged products:

First, we take for granted that the proper material should be chosen. This should be determined by the service required on the one hand, and the suitability of the metal for forging the article with ease and economy. An article of one form might be easily made from metal inclining to red shortness and be very serviceable when cold. On the other hand, the form might require so much abrupt bending, etc., that we might need metal more easily worked even if it were not quite so strong when cold.

That wrought iron is better suited for some forgings, and steel for others there is no doubt. For instance, iron chain, especially that for cranes and hoisting, is superior to steel both in reliability and wearing qualities. But for common purposes steel chain is lower priced. For such articles as pull bars with holes near the ends, steel is superior because of the tendency of iron to split out from the holes owing to its fibrous structure. If iron is used for such work the fibre should either be knotted or placed around the holes.

At times the question of what relation to certain parts of the article certain parts of the metal should be placed, becomes important. For instance, I believe when forging die blocks from ingots, the ingots, or blocks from them should be quartered and so forged as to bring the outside parts of the ingot to the face of the die. And there is a right and wrong way to place a wrought iron bar in relation to strains in some articles because of the way the "pile" was rolled. It will be seen that it is easier to break a bar edgewise made from such a pile than to do so flatwise. I have known instances in which this difference was the difference between failure and success.

It is perhaps needless to say that the question whether to use the press or hammer is of importance, especially on heavy forgings. The hammer, particularly if it is light in comparison to the work, will operate mostly on the surface, thus elongating the outside portions, and dragging the central part with them. On the other hand, the slow working press will drive the center the fastest. Whether you drive the outer portions faster or the inner part faster is to my mind a case of six of one and half a dozen of the other, so far as damage is concerned. Therefore, theoretically, there is a proper sized hammer or press head, driven at a proper speed for any given size to be forged. For some kinds of work roll forging will produce a superior product economically.

Forging is not generally considered a matter of engineering, but it becomes so in designing forgings. Of course, the first requisite is to have them answer their purpose, while at the same time forms should be provided such as can be cheaply and uniformly well made. The knowledge of the forgeman should go hand in hand with the engineer.

Often there is a great excess of metal put into a forging, because it is thought to simplify the making, when if reasonable forging talent had been brought to bear in designing it would have been found that the lighter article could have been as easily made as the heavier one. For instance, I show here a brake rod end for a railway car brakes, which weighs 7 pounds, and also one which weighs 2¾ pounds. Anyone can see that the heavier one has no advantage whatever over the lighter one, since they are to be attached to the same sized rod.

Now, taking, say, 800,000 cars which have been equipped with air brakes in recent years with an average of 10 to each car, the saving in this one item, small as it is individually, would have been 16,000 tons, to say nothing of hauling this dead load. In other words, this item at $30 a ton, would have meant a saving of $480,000. This is all the more remarkable because this form was adopted as a standard by engineers. Thus standards are made and used right along with defects, perhaps as to usefulness, and certainly as to economy.

Forgings should be free from "cold shuts" in bends, upsets, etc. In such articles as eye bars, hoisting hooks, etc., these are dangerous, because they may be caused by the method of bending or upsetting, and then closed in forging, so as not to be seen, thus causing the piece to break very unexpectedly. One of the troubles with electric welding has been a lack of pervading work after welding. But too much work after welding is bad. Tests on two-inch chain showed that a gang of men working by the day and slowly welding 40 links per day did not produce as good chain as another gang working by the piece and making 70 links per day. Remember the old adage, "Strike while the iron is hot," and do not forget the other one, "The devil gets the man who works cold iron."

Where wrought iron is used the fiber should, as far as possible, be unbroken in all bends, offsets, etc. Where wrought iron forgings are to be finished nicely, the slag should be washed out of the surface and the forging made so near to size that a very slight cut need be used in milling in order that a clean silvery surface may be produced. To cut much below the surface in such cases will show black streaks of slag.

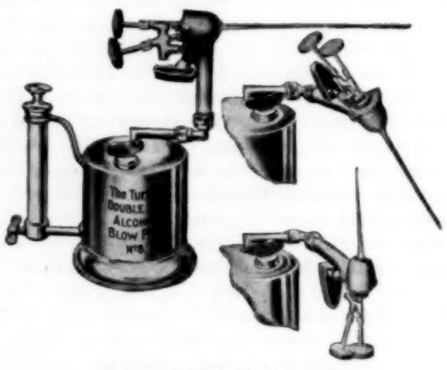
Drop forgings are often called for when the work could be shaped cheaply in a press with cast iron dies. Needless pains are taken to forge to exact size in parts where it is expensive to do so. Many blue prints are sent out on which it would be well to note "castings finish," and save cost. Again there are forgings on which fine forging finish is desirable.

The mandrils made for piercing billets for seamless tubes show a highly polished surface, made by a hammer, producing a very dense and hard skin, and therefore are better fitted for such work than a machine piece.

In making up a design for an article that could be in most part made easily of a given sized bar, we should try to avoid any deviation which would make it necessary to use a heavier bar. For example, a flat bar cannot be easily forged into a round bar of equal sectional area. I have lately seen a blue print of a piece of work about 6 feet long which could be made very cheaply from a rolled bar, were it not for one point that cannot be made from the proper sized bar needed for the other parts. And yet large quantities of these forgings are being used at probably twice the cost, simply because of this one point in this piece, to my mind a needless one.

DOUBLE JET BLOW PIPE.

A double jet alcohol blow pipe has been recently designed by the Turner Brass Works, of Chicago, and is intended to meet the merits of the oxy-hydrogen jet in the cleanliness and non-oxidizing quality of the flame. The device weighs three pounds packed ready for shipment and has a reservoir capacity of one pint. The burner is made on the double jet principle and is especially constructed for the consumption of wood alcohol. The illustration will show the facility with which the tool may be used. In starting the blow pipe pressure is obtained by means of the pump in the handle. The lower valve is then opened and the alcohol flows into the cup and is ignited after the valve is again closed. The gas thus generated is lit at the outlet to the burner and the flame is controlled by the upper valve. The blow pipe is claimed to generate a temperature of over 3,000 degrees Fahrenheit and flow 50 percent solder under favorable conditions.



THE TURNER BLOW PIPE.

The furnace of the Cleveland Furnace Co. was blown in Aug. 21 and has been working satisfactorily. N. A. Rogers, Buffalo, of Rogers, Brown & Co., S. A. Kennedy, manager of the Iroquois furnace, South Chicago, and Guy Barrett, a mechanical engineer from England, were among the visitors at the plant this week.

TRADE PUBLICATIONS.

The cold saw made by Jno. T. Burr & Son of Brooklyn, N. Y., has been illustrated in *The Iron Trade Review* and is now described in a booklet.

A recent Bulletin, No. 136, of the Stanley Electric Mfg. Co. of Pittsfield, Mass., is devoted to induction motors, and gives in a very concise and lucid manner the advantages of the three patterns in which this type of motor may be made. The reasons for making motors in three radically different patterns will be of quite general interest to mechanics.

No. 5 of the *Arrow* is like its predecessors published monthly in the interest of good tin roofs, and the kind made by the N. & G. Taylor Co. of Philadelphia in particular. A number of breezy articles and quaint sayings are directed toward the better knowledge of "Taylor Old Style."

Special Circular No. 22 reprints some records of sand pounding with pneumatic hammers from *The Foundry* and illustrates the different sizes of tools manufactured by the Philadelphia Pneumatic Tool Co. of Philadelphia. These rammers are also serviceable for tamping linings for steel converters.

The line of wood working machinery made by the Crescent Machine Co. of Leetonia, O., is described in a small pamphlet. There are a variety of foot and power band saws, combination saw tables, filing and setting clamps, jointers, etc.

Rogers, Brown & Co. of New York, N. Y., have several handsomely printed pamphlets of recent date. One of these is an address on the qualities of pig iron as shown by fracture and analysis, and was presented before the New England Foundrymen's Association by S. B. Patterson, assistant to the president of the Empire Steel & Iron Co. A second pamphlet treats of the furnaces and mines of the Empire Steel & Iron Co. and is well illustrated. A third briefly describes the brands of pig iron handled by Rogers, Brown & Co.

The small tool catalogue of the Pratt & Whitney Co. of Hartford, Conn., extends to 182 pages and is profusely illustrated. There is a new flue beading tool which maintains the center line of the bead in one positive position as the expander is rotated. The suggestions made for the betterment of orders indicate the amount of time often taken in writing for complete specifications, and the points made in the catalogue are more or less applicable to many other branches of business.

Rock drills, mining and quarrying machinery are discussed at length in catalogue 43 of the Ingersoll-Sergeant Drill Co. of New York, N. Y. The illustrations are a very pleasing feature, and the drills of this construction are shown at work in different countries and under a variety of conditions.

"Pump Data, No. 3" is the title of a circular on the Aldrich vertical quintuplex electric pump made by the Allentown Rolling Mills of Allentown, Pa.

Bulletin No. 32 of the Northern Electrical Mfg. Co. of Madison, Wis., describes steel crane motors. The fields of these motors are made of a special mixture of soft cast steel and are made in one piece.

The Reynolds Corliss engines made by the Allis-Chalmers Co., of Chicago, form the subject matter of a catalogue sent out recently. Many halftones illustrating the different plants of the company, views from the different departments (inclusive of the chief engineer and his office) and cuts of the apparatus with which the name of Edwin Reynolds is identified are submitted.

The monthly calendar of the Lumen Bearing Co., of Buffalo, has a praiseworthy reproduction of a painting entitled "The Heat of the Day."

The Beaman & Smith Co. of Providence, R. I., has issued the sixth catalogue relative to special designs of milling and boring machines. There are numerous full page halftones of metal working machine tools.

The Baltimore & Ohio Railroad has contracted for 50,000 tons of 85-pound steel rails for 1904 delivery. The Carnegie Co. will furnish 28,000 tons; Cambria, 12,600, and Maryland Steel Co., 10,000 tons.

The Washburn Co. of Minneapolis, Minn., has been incorporated with $200,000 capital, for manufacture of the Washburn car coupler, by E. C. Washburn, C. C. Crane, F. M. Crosby and J. R. VanDerlip.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Edison Foundry & Machine Works Co., Edison, O., capital $25,000, has been incorporated by P. S. Plumb, W. G. Hass, W. G. Lefever, G. W. Gilman, J. G. Miles, W. G. McLaw and C. R. Mozier.

The Oregonia Bridge Co., of Oregonia, Ohio, has been reorganized and incorporated under the laws of the State of Delaware, with a capital of $50,000. The plant will be removed from Oregonia to Lebanon, Ohio. The headquarters will be at the latter city after October 1st, where a steel and brick building 200x75 feet will be erected. The officers are: John Bradbury, president; C. A. Spencer, vice president; P. R. Spencer, treasurer, and H. W. Ivins, secretary.

The Catskill Foundry & Machine Works, Catskill, N. Y., has been incorporated with a capital of $50,000.

The Caldwell & Drake Iron Works, Columbus, Ind., is adding considerable new equipment on account of its increasing business.

The American Rolled Gear Car Wheel Co. has been chartered under the laws of New Jersey with a capital of $250,000. The company is formed to manufacture car wheels of a special rolled steel, which are claimed to have a special strength. The main office of the company is at 407 Arrott Building, Pittsburg.

The Salem Iron Works, of Winston-Salem, N. C., will be in the market shortly for a 10-ton cupola, a crane, blower, ladles, etc.

Fires and Accidents:—

Fire in the Burrill foundry at Bradley, Ill., a few days ago, caused damage to the amount of $2,000.

Fire, Aug. 18, destroyed the boiler works of John O'Brien at St. Louis, the loss being $15,000. Mr. O'Brien expects to rebuild in East St. Louis.

The Great Northern Railway shops at Quebec were damaged by fire to the extent of $75,000 on buildings and machinery; covered by insurance.

The Heywood-Dobbins machine shop, Jennings, La., was damaged $20,000 by fire Aug. 18. Insurance $10,000.

Fire in the repair foundry of the Illinois Steel Co., at South Chicago, Aug. 19, caused a loss of $4,000.

The large plant of Parsons, Rich & Co., Newton, Iowa, manufacturers of gasoline engines and self-feeders for threshing machines, was destroyed by fire Aug. 21. Loss $60,000. Insurance $17,000.

New Construction:—

Work on the erection of the new plant of the International Pump Co. at Harrison, N. J., is progressing rapidly and the dozen buildings that will constitute the plant are making good headway. The machine shop, which is the largest building in the group, is fast nearing completion and the installation of machinery will be commenced at an early date. This building is 1,683 feet long and 122 feet wide. When the plant is completed the plants at Elizabeth, N. J., and Brooklyn, N. Y., will be dismantled.

The Canadian Pacific Railroad will expend $1,000,000 in the erection of large shops at Winnipeg, Can. The following buildings will be erected: Office and storehouse, 85x260; foundry, 100x100; oil house, 40x80; blacksmith shop, 100x200; freight car shop, 100x400; passenger car shops, two buildings, each 100x205; power house, 100x100; planing mill, 100x200; drying kiln, 35x80, and locomotive shop 162x700 feet. The total floor space of all the new structures will amount to 350,000 square feet.

The Barnard & Syphers Machinery Co., Spokane, Wash., will erect a blacksmith shop and warehouse in connection with its machine shop. The new building will be 100x75 feet.

The Carpenter Steel Works, Reading, Pa., will employ 800 more men when the three new mills are finished. To provide for this expenditure an issue of $1,500,000 bonds will be made. The open-hearth and bloom mills will be built along the river front. The wire mill will be a four-story building. The com-

pany has Government contracts for over $2,000,000 worth of shells.

The Louisville Bolt & Iron Co., Louisville, Ky., will have its output greatly increased by the erection of several additions to the existing buildings. Some rolling mill machinery is also to be installed.

The large addition to the Aetna Foundry Co.'s plant, Springfield, Ill., has been completed. It doubles the capacity of the foundry.

The Corliss Engine Works will erect a one story machine shop 78x145 feet and a boiler house 39x30 feet at Fifth and Luzerne Sts., Philadelphia.

The city of Columbus, O., is preparing to build a machine shop for the repair of fire engines belonging to the city. The matter is in charge of Director of Public Safety Meek.

Some additional details have been announced regarding the new shops to be built by the Louisville & Nashville Railroad at South Louisville. The plan as laid out comprises about 25 acres. The various buildings and machinery will cost over $2,000,000. All will be of brick and stone, and the foundry will be 443x90 feet. The wheel shop, the store-house for freight car material and the pipe shop are to be combined into one big building 202x90 feet. The erecting shop is to be 171x218 feet. The freight car repair shop is to be 400x145 feet. The boiler shop is to be 78x140 and will be used for both manufacturing and repairing boilers. There will be numerous other buildings. About 2,500 men will be employed.

The Southern Foundry & Machine Co., whose plant at Knoxville, Tenn., was recently destroyed by fire, will rebuild at once, and will be ready for operation by Oct. 1. The company has decided to increase its capital stock from $55,000 to $100,000.

The Baldwin Locomotive Works, Philadelphia, have let a contract for a power house 63x40 feet, with a stack of 125 feet, at a cost of $15,000.

The Dobson Mfg. Co., Rockford, Ill., has commenced the erection of a foundry as an annex to its business. The structure will be 70x180 feet, fully equipped. Heretofore the company has purchased its castings.

Work has begun at Oswego, N. Y., on the new car repair shop 400x44 feet, being erected by the Watertown & Ogdensburg Railroad Co. The plant was formerly located at Rome, N. Y.

Among the improvements to be made at the Poe lock at Sault Ste. Marie, Mich., this winter, will be the installation of ten new valve engines of the most recent make. Seven bids were received and were opened Aug. 20. They are as follows: Vulcan Iron Works, Chicago, $6,990; Variety Iron Works Co., Cleveland, $7,000; Power Specialty Co., New York, $7,425; Great Lakes Engineering Works, Detroit, $8,350; Allis-Chalmers Co., Chicago, $9,750; Buffalo Forge Co., $14,700.

The Pittsburg and Valley Districts:—

The first cast of 60-inch pipe was made at the Scottdale, Pa., plant of the United States Cast Iron Pipe & Foundry Co. last week. The foundry has been greatly extended to provide for this department.

The striking tin house workers of the South Sharon, Pa., plant of the American Tin Plate Co., returned to work after being out three days, a compromise having been effected.

The structural plant of the South Pittsburg Iron Works, Claysville, Pa., was placed in operation several days ago. Work on the plant was commenced about six months ago and but for delays in securing material it would have been completed some time ago. Officials of the company claim to have a large number of orders on their books.

Ten mills of the Shenango plant of the American Tin Plate Co., New Castle, Pa., which have been idle for some time, have again resumed operations. All the mills of the plant are now on in full.

General Industrial Notes:—

The Midland Steel Works, owned by the American Steel Co., at Muncie, Ind., have been shut down for an indefinite time on account of shortage of orders.

At the annual meeting of the Cambria Foundry & Machine Co., Johnstown, Pa., Aug. 18, the following directors were re-elected: John N. Horn, George A. Hager, Harry M. Bensshoff, James H. Geer and N. B. Griffith. The affairs of the organization were shown to be in a prosperous condition. The work on the new plant is progressing favorably.

The Astoria Steel Co., Astoria, N. Y., expects to have its plant for the manufacture of steel castings in operation about Oct. 1. It will have a capacity of 100 tons a day.

Kemp & Faulk, Williamsport, Pa., are moving their foundry to a new site where they will permanently locate. The property acquired by them has been improved.

From present indications the Waukesha Sheet Steel Co., Waukesha, Wis., will resume operations at its plant this fall. J. E. Jones, business manager, states that he has contracted for one year's supply of steel billets.

Capt. J. M. Elliott, Jr., of Birmingham, Ala., has sold to the Alabama Iron & Steel Co. a large tract of land in the Greasy Cove district for $10,165.

The Thomas Devlin Mfg. Co., Burlington, N. J., has opened its new plant on the former site of the Burlington College. The buildings are the foundry, 450x125 feet, and the annealing room, 250x70 feet. Other buildings are being erected.

The Chicago Pneumatic Tool Co. has just closed a contract to supply the Chilean navy with pneumatic tools of all kinds for the building and repairing of ships. The navy yards of the Chilean government will be completely equipped with pneumatic riveters, hammers, drills, hoists and other appliances.

The Ford Auger Bit Co., of Holyoke, Mass., has purchased the plant formerly owned by the Massachusetts Screw Co., increased business having made larger quarters necessary.

At a recent meeting, the stockholders of the Warren Building & Improvement Co., Warren, Mass., voted to accept the offer of Frank Slater of $14,000 for the company's property, including a machine shop and foundry, which was used by the Slater Engine Co. for ten years, until it went into bankruptcy. The property is said to have cost $50,000. A new company will be reorganized by Frank Slater, George D. Laval, at present general manager of the George F. Blake Mfg. Co., of East Cambridge, and Charles Moore of the same concern, and will carry on the business in the plant. It is the intention of the new company to expend $10,000 in repairs on machine shop and foundry.

Suit has been commenced in the United States Court at Elwood, Ind., by tin plate workers who invested in the new Juniata steel plant at New Castle, Ind., for an accounting of the affairs of the concern. The plant is inoperative at the present time, due, the management claims, to its inability to secure raw material.

The Burrows Mfg. Co., of Williamsport, Pa., manufacturer of steam specialties, has decided to remove its plant to York, Pa., where the machine shops of Baugher, Kurtz & Co. have been leased.

The Mobile, Jackson and Kansas City Railroad has placed an order with the American Car & Foundry Co. for eight freight and two passenger locomotives, 200 flat and 50 box cars.

The Stewart Boiler Works, Worcester, Mass., has just completed an addition to its main building, 120x74 feet.

The plant of the Baltimore Marine Railway, Machine & Boiler Works, Baltimore, Md., has been purchased from the received by E. J. Codd, and is again in full operation.

The Wabash Bridge & Iron Co., of Wabash, Ind., made an assignment last week. The liabilities are estimated at $200,000 and the assets at $100,000.

The old plant of the Caldwell Foundry Co., Fort Payne, Ala., which has been idle for some time, will shortly be placed into operation. A specialty will be made of cast iron car fittings. The concern which has taken over the plant is known as the Valley Foundry Co.

The Pennsylvania Steel Co. will rebuild stack No. 3 at Steelton, Pa., and will blow out the furnace for this purpose within a month. The rebuilt stack will be 84 feet high and will be a duplicate of No. 4. The output will be increased from 200 to 400 tons daily. At present the company has five stacks in commission and is making 1,000 tons of iron daily.

The Columbus Forge & Iron Co., Columbus, O., has increased its facilities for producing drop forgings of all descriptions. The company manufactures machine forgings and shafts, drop forgings, crucible tool steel and nickel steel forgings and anvils, vises, railroad track tools and oil well sucker rod joints.